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H. W. WILEY, Chief of Bureau.

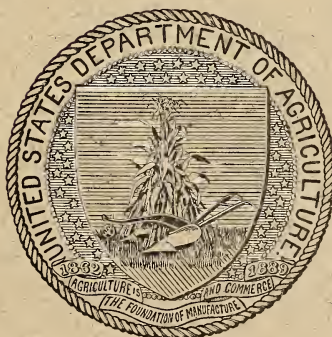
ENOLOGICAL STUDIES.

THE CHEMICAL COMPOSITION OF
AMERICAN GRAPES GROWN IN
OHIO, NEW YORK, AND VIRGINIA.

BY

WILLIAM B. ALWOOD,

Enological Chemist.



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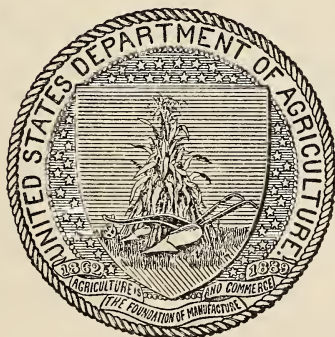
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF CHEMISTRY,
Washington, D. C., March 27, 1911.

SIR: I have the honor to submit for your approval a report on the results of a three-year investigation of the composition of American grapes, conducted at Charlottesville, Va., and Sandusky, Ohio, by William B. Alwood, the enological chemist of this bureau, covering the principal commercial varieties of American grapes grown in the central and eastern sections of the country, and also other varieties not generally cultivated. These data, even though the study is far from complete, are of practical importance to the grape growers and manufacturers of grape by-products, as well as of scientific interest, and I recommend their publication as Bulletin No. 145 of the Bureau of Chemistry.

Respectfully,

H. W. WILEY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

PREFACE.

In the conduct of certain enological work it became evident that there were almost no chemical data available regarding the character of grapes grown in Virginia, in northern Ohio, in northern and central New York, and in some other parts of the country. The condition was much the same as that which was found in the beginning of the enological studies on the production of cider. It is evident that in order to treat a subject of this kind in a rational way it is important that the character of the fruits under consideration should be definitely known. After the investigation on the composition of the grapes in the Piedmont region of Virginia was begun it was found advisable to establish a laboratory, or laboratories, for further studies on the composition of this fruit and the products made therefrom in the localities which have become so famous for the production of grapes, grape juices, and wines. The establishment of a branch of the enological investigations at Sandusky, Ohio, rendered it possible to study in situ the character of the grapes produced in that region. This study has now continued over a period of three years, and data are at hand for drawing at least preliminary conclusions respecting the general character of the fruit produced. As is the case in every grape-growing country, it has been found in northern Ohio and central and northern New York that the character of the grape varies from season to season, and often in the same vineyard or locality during a given season. This variation shows the necessity which exists in this locality, as well as everywhere else, of securing by careful selection the grapes which are to be used for specific purposes. Those that are sound, healthy, mature, and suitable for the purpose should be separated from the imperfect, unripe, damaged, or otherwise undesirable varieties. In the manufacture of unfermented grape juice, for instance, it is desirable that the grapes yield a juice which is palatable, wholesome, and easily treated. It is not desirable to bottle the fresh juices and sterilize them without removing, in so far as possible, the sedimentary matters which will be deposited on heating and standing. Many varieties of grapes lend themselves much more readily to treatment of this kind than others. The chemical composition and physical properties of the fruit and its amenability or resistance to treatment, either in the preservation of the juice in an unfermented state or in the manufacture of wine, are

of the greatest importance. As is well known, the predominant acid in ripe grapes is tartaric. The presence of this acid, either in a free state or in combination with lime or potash, is necessary to give to the grapes the peculiar flavor for which they are noted. In other words, the acid content of the grape is one of the ingredients of chief importance from an organoleptic point of view. A grape which is without acid would be totally insipid, and would yield a juice not much better than sweetened water. On the other hand, a grape juice in which the acid is excessive is unpalatable, at least to most persons. Hence the production of a grape with the proper degree of acidity to give character and not enough to impair taste is of great importance.

The studies which have been made and which are detailed in the following pages throw much light on this important problem, even though they are far from complete, indicating what varieties of grapes and what conditions of environment give the best results.

Equally important from the point of view of vinification is the sugar content of the grape. The only source of natural alcohol in wine is fermentation of the sugars which exist in the original grape. These sugars exist in combination with other bodies, many of which enter into the finished product and serve to give it character and quality. In fact, the smaller the quantity of alcohol which can be secured in the finished wine, and at the same time permit of its manufacture and keeping, the better. Other things being equal, the wine which has the smallest percentage of alcohol is to be preferred. The data which have been secured indicate the varieties of grapes which give the best percentage of sugar for proper fermentative purposes.

These studies will lay broad and deep the foundation for the practical working out of the problem of the utilization of grapes for the various purposes for which grape products are employed. While the work has been carried on under the general direction and supervision of the Chief of the Bureau of Chemistry, the details of it and the technique of the processes have been in the hands of Mr. William B. Alwood, who has given to the work his undivided attention and has with enthusiasm and success attacked the many problems which have been presented.

H. W. WILEY,
Chief of Bureau.

WASHINGTON, D. C., *March 10, 1911.*

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ENOLOGICAL STUDIES.

THE CHEMICAL COMPOSITION OF AMERICAN GRAPES GROWN IN OHIO, NEW YORK, AND VIRGINIA.

OBJECT OF THE INVESTIGATION.

In the discharge of duties devolving upon the Bureau of Chemistry under the food and drugs act it became apparent that definite data on the methods of wine making and of the products made in the several wine districts of the country were needed. As chemical data on the composition of the fruit used in the manufacture of grape juices and wines were not available, it was found necessary to make a fairly complete fundamental study of the grape and the by-products made from this fruit. As a first step in this direction a detailed study was made of the chemical composition and general character of the several varieties of grapes grown in the Central and Eastern States, especially those sent to the wineries at Sandusky, Ohio, with a view to determining the suitability of these grapes for food purposes and for wine production. Further than this a chemical study of the commercial wines produced in the middle and eastern wine-growing districts was also found necessary for the purpose of comparing their quality with that of wines which might be made under the direction of the bureau from the grapes commonly used at the wineries for this purpose.

The need of this investigation in the administration of the food law is readily seen if one compares the widely varying statements of the grape growers and the wine makers as to the quality of the fruit produced and the possibility of making straight wines from this fruit, and also if one is familiar with the general practice of watering and sugaring (i. e., gallizing) the wines made in the districts mentioned. For these reasons it is important to determine fully the character of the strictly nature wines made from these grapes. There appeared to be no other method of securing these data than by a thorough chemical investigation covering the whole subject of the fruit grown and the character and composition of the wines produced and sold in the districts in question. The term "American grapes" is here used to distinguish native seedlings and crosses of these with the

European species produced in America, from the distinctly European varieties grown so largely in California.

It is claimed by some that the grapes of New York State and the Atlantic seaboard States are richer in sugar and not so acid as the fruit grown in the Lake Erie district. Because of the proximity to a very large grape-growing industry and of the important wine industry located there the work has thus far been carried on chiefly at Sandusky, Ohio, but it is intended to extend it as rapidly as possible to other important centers. A large portion of the northern grape belt has already been covered in this preliminary investigation, and the importance of the crop and its by-products and the necessity for accurate information seem to fully justify this course. But the data now in hand will render possible more detailed investigations of certain specific features—as, for instance, the variability in composition of the more important varieties under differing conditions of soil, climate, and culture—which appear to promise results of much practical importance.

GRAPES GROWN IN OHIO AND NEW YORK.

METHODS OF OBTAINING SAMPLES.

In an investigation of this nature the character of the sample used is of great importance. The data for the individual samples show that the difference in composition between samples from the same source may be sufficient to be confusing. Hence, with a view to forestalling hasty conclusions, a very large number of samples, from as many sources as possible, have been examined. This should render the averages presented quite reliable. There will certainly be a very considerable variation in composition from year to year, the extent of which can only be determined by continuing these examinations until sufficient data have been secured to furnish a basis for a final statement.

The season was so far advanced when this work was begun in 1908 that arrangements could not be made to secure samples from a large number of individual growers; hence they were taken at the wine cellars. But for the years 1909 and 1910 a large number of samples were secured directly from the growers, and to check against the results so obtained samples were taken from the wine cellars. In getting samples from growers the selection of "extra quality" has been prevented as far as possible, the aim being to use the average commercial fruit. In any case the large number of samples examined from the various sources minimizes the incidental variations so as to warrant a reasonable belief that the averages herein presented represent the quality of the fruit for the season in question.

The two elements of prime importance in the grapes used for the manufacture of unfermented grape juice, for wine making, or for other by-products, are the amount of sugar and the amount of acid present in the fruit; hence the work undertaken in 1908, the first season at Sandusky, was confined almost wholly to sampling and examining crops of grapes found at the various wineries and juice factories, and to observations of the methods of vinification employed. A small amount of wine was made for technical study. It was unfortunate that the investigations could not have been begun at the opening of the vintage season in 1908, because the crop was especially good that year for making high-class products, but it was impossible to make preparations for more extensive operations than those indicated.

PREPARATION OF THE SAMPLE FOR ANALYSIS.

The samples of fruit secured for 1908 were taken at the various wine cellars directly from the packages as they arrived at the cellars, and the name and address of the grower was invariably entered on the records with each sample. About 4 pounds of fruit were taken for a sample, and care was taken to secure an average of the crop. These samples were crushed and pressed by hand in the laboratory of the Duroy & Haines Co., who kindly furnished facilities for this work.

The preparation of the samples is a matter of considerable importance. Experiments on crushing in a mortar by using a pestle, on crushing by hand in porcelain vessels, and also with small hand grinders were made. After careful tests by these methods it was found that crushing by hand is the best method of procuring a sample. In this way each grape is crushed practically to the same extent, and the whole mass is reduced to a pulp so much more homogeneous than by any other method tried, that this one was adopted for all work during the years 1909 and 1910. The stems were in every case left in the pulp.

When crushed to a pulp the sample was transferred to a piece of cheesecloth folded double, spread over a porcelain dish, and the pulp was pressed by gathering the edges of the cloth firmly in one hand and gently squeezing the mass until the juice was extracted. The pulp is in this manner reduced to a ball in the cloth, and by gripping this firmly with the free hand and applying pressure properly a careful operator can reduce the pulp to about the condition of dryness arrived at by applying 1,500 pounds direct pressure in a hydraulic press. The amount of pressure used will affect considerably the acid present in the expressed juice; hence care is required in this manipulation to secure comparable results.

TESTS AND ANALYSES MADE.

Each sample of juice was then tested as to density with a Brix spindle, and in most instances a sample was saved for further examination. These samples for the year 1908 were bottled and preserved with mercuric chlorid, using tablets purchased at the drug store, and in this condition they were sent to Stonehenge laboratory, Charlottesville, Va., for analysis. The final analyses were completed by January 5, 1909, and covered only specific gravity, total solids, sugar-free solids, total sugar, and fixed, volatile, and total acid. These data were carefully checked, and in the acid determinations allowance was made for the use of the mercuric chlorid tablets, each of which contained 0.5 gram of mercuric chlorid and 0.57 gram of ammonium chlorid. One tablet was used for 400 cc of fresh juice. A correction to allow for the acid present in the tablet was made by deducting 0.075 gram tartaric acid per 100 cc of sample. Volatile acid was determined on the samples taken in 1908, but the amount was so slight that it is not reported in the tables; seldom was 0.01 gram per 100 cc of sample found. During the years 1909 and 1910 volatile acid determinations were not made.

The results on total acid for the samples taken in 1908 are surprisingly low. This was noted as the samples were analyzed, and the work was carefully checked. The only explanation which is suggested is that during the first season the samples were not pressed sufficiently to bring out all the acid present. It will be readily understood that for red wines the acid content secured by crushing and pressing the fresh fruit will not be the total acid secured by the fermentation of the pulp and then pressing by power, as is customary in the wineries, but for white wine the result should be practically the same as when the fruit is crushed and pressed by power. These points will be covered and the data given in an additional report on the fermentation experiments conducted at the Sandusky laboratory.

The preparation of the samples during the years 1909 and 1910 was uniformly by hand as just described; but, having equipped a field laboratory at Sandusky, the analyses of the juice were made there at once, as far as possible. In every case the acid was determined by the titration of the freshly pressed and filtered juice, and a gravity reading was made on unfiltered juice at the same time, using a Brix spindle specially made for this work. When the analysis could not be made promptly a sample was preserved in a pint champagne bottle with 0.2 gram of mercuric chlorid. The full analysis was completed usually within from 30 to 60 days after sampling. If the presence of sucrose was suspected the analysis was made at once, because experience showed that inversion of this form of sugar occurred even in the chemically preserved sample.

The methods of analysis followed are those laid down in Bulletin No. 107, Revised, Bureau of Chemistry; certain details for which no explicit directions are given were made to conform to well settled laboratory practice. Total solids were derived as for wine from the table given in Bulletin No. 107, Revised (p. 218 et seq.), and the sugar-free solids by subtracting the total reducing sugar from the total solids, save in cases where the sample showed sucrose. In such instances the sugar-free solids were obtained by subtracting the sum of the reducing sugar and sucrose from the total solids. Subtracting the total sugar found by inversion when sucrose is present results in reducing the sugar-free solids below normal.

The acid determination was made on filtered juice without previous heating, by titrating with tenth-normal sodium hydroxid, free from carbonate, using a neutral solution of azolitmin on a spot plate as indicator. When the juice was highly colored it was found advantageous to dilute the portion taken about two and one-half times with recently boiled but cold water, that the reaction might be more clearly seen.

The sugar determinations were made after the methods of Munson and Walker (Bulletin No. 107, Revised, p. 241), but it was found possible to use the gooches twice without cleaning. This was definitely determined by trial, as shown by the following check results:

Reducing sugar determinations to test need of cleansing gooch before each determination.

[Grams per 100 cc.]

Filtered and weighed on clean pad:		Filtered and weighed on 4.3 decigrams cuprous oxid:	
White grape juice—		White grape juice—	
1.....	21.11	5.....	21.01
2.....	21.13	6.....	21.05
3.....	21.11	7.....	21.08
4.....	21.11	8.....	21.08
Average.....	21.12	Average.....	21.06
Red grape juice—		Red grape juice—	
1.....	16.88	5.....	16.83
2.....	16.87	6.....	16.91
3.....	16.85	7.....	16.85
4.....	16.91	8.....	16.83
Average.....	16.88	Average.....	16.86

The Brix readings given are those made on the fresh juice, with a standardized Brix must spindle especially devised by this laboratory and corrected to 20° C. in accordance with the regulations of the Bureau of Standards. The specific gravity readings given were in every case determined by pycnometer when the sample was analyzed. These notes apply to the work of 1909 and 1910; some slight variations from this detail occurred during the preliminary work of 1908.

INVESTIGATION OF 1908.

The data for each variety sampled in 1908 are summarized in Table I, page 20, by bringing the results on all the samples of a variety from each locality together and giving the average; if more than one sample was analyzed, the maximum and minimum results for each locality are shown. The figures presented in this table cover too few samples to warrant any extended discussion; from several important localities only one sample of a given variety was examined. This was due to lack of time to organize the work completely for that year. Further, the data are deficient in that the territory was not adequately covered. These criticisms, however, do not deprive these data of value, and, as far as they go, the results show a remarkably high sugar content in the great majority of the samples analyzed. In fact, the grape crop was of very good quality that year, and it was often stated that not in 20 years could such quality be expected again. Only one sample of Catawba was analyzed from Middle Bass and one from North Bass, Ohio, but the Brix readings on the other samples from these localities show that they were all richer in solid matter and hence presumably were higher in sugar than the two analyzed. The importance of the Brix readings of fresh must, as a means by which the grower can determine with considerable accuracy the sugar content of the fruit, is worthy of special attention.

The data¹ show that 19 samples of Ives, notably the poorest grape in sugar content of those used for wine in the Sandusky district, gave an average percentage composition of 15.06 per cent of sugar and 0.485 of total acid. Concord, which is usually not much superior to Ives, shows for 11 samples 16.20 per cent of sugar and 0.434 of total acid. Clinton, a variety not largely grown, showed in 5 samples 17.76 per cent of sugar and 0.998 of total acid. Norton, a grape apparently not well adapted to the Lake district, gave for 3 samples an average of 22.79 per cent of sugar and 0.907 of total acid. The fermented pulp will, of course, give a wine that is still more acid.

It is especially important, however, to note that Catawba, the chief white wine grape of the Lake district, on an average of 25 samples, showed 18.81 per cent of sugar and 0.750 of total acid. Delaware, which is well known for its high quality, showed for 2 samples an average of 22.84 per cent of sugar and 0.423 of total acid; and Iona, a superb wine grape, but not extensively grown, in one sample had 19.35 per cent of sugar and 0.623 of total acid. These results as to sugar content indicate a very high quality of fruit.

¹ For percentage data see table on page 16.

INVESTIGATION OF 1909.

During the season of 1909 preparation was made to extend the work by equipping a laboratory at Sandusky, Ohio. Accommodation was thus provided for handling a large number of samples and for making fermentation experiments on the different varieties of wine grapes. The report on the fermentation experiments is not, however, included in this report, which deals only with the composition of the fruit samples. A canvass of the Lake Erie district and as far east as the central New York grape district was made during August and September, 1909, and correspondents were selected at several points of importance who were relied upon for samples of the crop for the laboratory work, and a number of whom rendered valuable assistance. The samples were sent by express or boat, usually in small baskets, to the Sandusky laboratory, where the notes on quality and the chemical examinations were made.

This arrangement furnished a large number of samples direct from the growers, but others were also secured from the wine cellars in Sandusky at such periods as seemed most likely to furnish data on the full range of the fruit crushed for wine. However, samples from the wine cellars were not usually considered as representing individual crops during 1909, but were regarded as a composite of the stock on hand at the time the sample was taken. From the American Wine Company composite samples were taken of the expressed juice as it was collected in the settling tank. Such samples are reported under the names of the several cellars.

The data determined at the time of sampling during 1909 comprise a Brix reading on the fresh must, and titration for total acid as soon as the sample was crushed and pressed; in most cases the sample was further analyzed by determining the specific gravity by pycnometer, the total solids, sugar-free solids, and total sugar. Inversion was only resorted to when the results showed excessive sugar-free solids by direct determination. Volatile acid was not determined on the fresh fruit during 1909, as the data for the previous year showed this to be unimportant. Samples which were not analyzed as fresh fruit were treated with pure mercuric chlorid and stored for analysis later, 0.2 gram being used for 400 cc of juice. A correction for the use of mercuric chlorid was found to be unnecessary when the pure crystallized salt is used. The results on acid in a juice are usually lower if the sample has stood in a bottle for some time, owing to the precipitation of crude "tartar." Tests on a number of varieties showed this to amount approximately to 0.064 gram per 100 cc for white juice and 0.051 gram for red juice. The results given in the table are not, however, affected by this fact, because the acid was determined in the fresh juice.

The results for 1909 are summarized by varieties, bringing together all the samples collected in each locality. These data are found in Table II (p. 21). The composite samples from the individual wine cellars are arranged together without reference to the locality from which the crops came.

The year 1909 was remarkable for the very heavy crop of fruit borne on the vines. It was commonly remarked by the growers that such an abundant crop had seldom been produced. But unfortunately the latter part of the season was very unpropitious for the ripening of the load of fruit with which the Catawba vines were weighed down. Cold, rainy weather set in when the main crop was barely colored, and this continued with slight intermission until actual freezes injured the foliage, with the result that in some vineyards a considerable portion of the crop did not mature and was either a total loss or was sold at low prices—from \$12 to \$15 per ton. A considerable number of these pale Catawba samples were tested for sugar and acid and found to run from 2 to 4 per cent lower in sugar and about 2 per mille, i. e., per 1,000, or 0.2 per cent, higher in acid than the average mature grapes. In 1909 every variety to which special attention has been called (namely, Clinton, Concord, Ives, and Norton of the red-juice grapes, and Catawba, Delaware, and Iona of the white-juice grapes), shows a sugar content from 1 to 4 per cent lower than in 1908, and the acid is higher. Yet even in this admittedly very unfavorable year the grapes were, on the whole, of a good quality. It is notable that out of 16 samples of Catawba juice secured from a single cellar only 2 fell below the average of 16.31 per cent of sugar for the entire 84 samples from all sources in Ohio, and that the acid was only slightly higher than the average in 8 instances out of the 16. Thus even in a bad crop year it is shown that fruit of very fair quality can be selected. The 16 juice samples mentioned were from selected crops bought for making champagne wine and indicate that the quality of the fruit can be greatly affected by the method of growing the crop.

INVESTIGATION OF 1910.

The season of 1910 was marked by the almost total failure of the grape crop in some sections of the northern fruit belt, due to the severe late spring frosts. However, the Lake Erie and central New York districts gave about 40 to 60 per cent of a crop. On the whole the quality of the crop was in most instances quite equal to that of 1908. The sampling work was extended to cover more fully the two districts mentioned, and a few samples of Concord grapes were secured from Michigan. The manipulation of the samples was the same as previously noted, and all deferred analyses were completed by December 20, 1910. A large number of varieties were analyzed

which, judging from the results, are of little importance for the manufacture of grape products, but it was thought best to include in the investigation all varieties found in the districts covered for a period of several years, so that the data accumulated might be exhaustive.

During the season of 1910 the work was furthered by the hearty cooperation of the New York Agricultural Experiment Station, both at the main station at Geneva and at the grape station at Fredonia, N. Y. Prof. Hedrick and his colleagues collected and forwarded all the samples from Geneva and from the Chautauqua grape belt. In the Lake Keuka district the very efficient cooperation of Mr. L. D. Masson at Hammondsport, N. Y., and of Mr. W. N. Wise at Penn Yan, N. Y., was secured. For the important grape district about North East, Pa., Mr. Fred Johnson, agent and expert for the Bureau of Entomology, in charge of the investigation of grape insects at that point, was authorized to collect and forward samples of fruit to the Sandusky laboratory, which he did in a most satisfactory manner. For the Lake Erie islands Mr. Henry Elfers at Kelleys Island, Mr. H. J. Burns at Middle Bass, and Mr. R. Siefield at North Bass, rendered very valuable assistance in collecting and forwarding samples.

The tabular presentation of the analyses for 1910 follows the same plan as that of the two previous years and is sufficiently comprehensive to warrant careful study both by the grape grower and the manufacturer of grape by-products. (See Table III, p. 27.) It is not warrantable at this time to theorize on the results of these three years of investigation further than to point out the remarkably good quality of such varieties as Catawba, Delaware, Iona, and others of the grapes with light-colored juice and also the rather unexpected high sugar content shown by Concord. Norton and Clinton have a very good percentage of sugar, but such a very high percentage of acid as to render their value for the northern grape belt problematical. But Montefiore, which is so little grown that it could not be studied sufficiently to determine its value with any certainty, has much promise because of the low acid and the high sugar content. If it can be successfully cultivated this should prove an important grape.

A tabular statement of the average sugar and acid content for four of the red and three of the white juice grapes commercially accepted as the best for wine making in the northern grape belt is given in the following table, which covers the data for the three years during which the work has been in progress. During the first year only Ohio samples were examined, but after that time samples from other localities were included, except in the case of Norton. The Ohio samples are given separately and then the data for all of the samples together, since that district is so much better represented in most instances, and also, thus far, presents some indications of a higher

sugar and lower acid content than fruit from the other States. This is an interesting point, but it must be confirmed by a more complete examination of fruit from the other sources before a definite statement can be made.

The varieties compared include, as stated, some of the most important commercial varieties, and also represent the three groups of native grapes from which our cultivated varieties are mostly derived, namely, the *Riparia*, *Aestivalis*, and *Labrusca* groups, as well as *Vinifera* hybrids. Further investigations, dealing more critically with a large number of varieties of each of these groups, are much needed.

The Delaware and Iona (*Labrusca* and *Vinifera* hybrids) have a remarkably high sugar and low acid content; Catawba, a *Labrusca*, with possibly a strain of *Vinifera* parentage, shows fairly high sugar and also high acid; the Ives and Concord, pure natives of the *Labrusca* group, are low in acid and not sufficiently high in sugar to make a claret wine of the usual strength; that is, from 9 to 10 per cent of alcohol. Clinton represents the *Riparia* and Norton the *Aestivalis* group of our native species. Both of these can be grown with sufficient sugar content to make a fine, sound wine, but they are strongly acid.

Comparison of average sugar and acid content of important varieties for three years.

[Percentage data calculated from results expressed in grams per 100 cc (Tables I-III) by dividing by the specific gravity.]

Variety and year.	Samples from Ohio.				Samples from all sources.			
	Total sugar.		Total acid.		Total sugar.		Total acid.	
	Number of samples.	Amount.	Number of samples.	Amount.	Number of samples.	Amount.	Number of samples.	Amount.
Clinton:		<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>
1908.....	5	17.76	5	0.998				
1909.....	12	16.14	12	1.553	16	16.39	16	1.638
1910.....	3	18.99	3	1.755	7	18.12	7	1.872
Concord:								
1908.....	11	16.20	11	.434				
1909.....	46	14.92	40	.646	76	14.89	69	.681
1910.....	30	16.77	30	.693	88	15.75	88	.785
Ives:								
1908.....	19	15.06	19	.485				
1909.....	27	14.05	26	.721	30	13.76	29	.720
1910.....	18	14.79	18	.693	22	14.82	22	.720
Norton:								
1908.....	3	22.79	3	.907				
1909.....	11	17.84	11	1.657				
1910.....	5	19.53	5	1.534				
Catawba:								
1908.....	25	18.81	25	.750				
1909.....	84	16.31	84	1.067	91	16.59	91	1.080
1910.....	84	19.20	84	.984	93	19.01	93	1.016
Delaware:								
1908.....	2	22.84	2	.423				
1909.....	22	18.96	17	.748	36	18.92	31	.762
1910.....	11	22.02	11	.720	28	19.57	28	.803
Iona:								
1908.....	1	19.35	1	.623				
1909.....	3	17.82	3	.757	4	18.18	4	.770
1910.....	5	19.51	5	.793	8	19.16	8	.921

SEEDLINGS AND UNKNOWN VARIETIES.

In covering as large a territory as that from which the samples listed in this report have been collected, naturally a number of seedlings or unknown varieties have been received. Of these, nine appear to merit special attention. For convenience only, these are numbered from 1 to 9.

The first mentioned in the table which follows was found in the vineyard of Mr. N. Schneider at Vermilion, Ohio. He states that it is a seedling grown by him some years ago direct from Catawba, and the characteristics of the vine and the fruit bear out his statement as to parentage. It has a more neutral flavor than Catawba and when fully ripe tastes less acid, but the analyses do not show much in its favor as compared with the parent stock. However, its vinous character deserves attention.

The second of these seedlings was found in the vineyard of Mr. E. L. Steuk, at Venice, Ohio, and is of unknown parentage. The full discussion of this grape given in Bureau of Chemistry Bulletin 140 renders further consideration unnecessary. Yet it is important to call attention to its very low acid and fairly high sugar content. The flavor is very mild, almost insipid when ripe. The fruit is somewhat of the Iona type.

The seedling secured from Mr. J. H. Bauman, Kelleys Island, Ohio, is high in sugar and has a very desirable type of bunch, the fruit is red in color, with white juice and good flavor. No sample of this fruit was secured in 1910.

The sample from Mr. L. C. Dodge, Middle Bass Island, Ohio, did not show up well in the analysis for 1909, but in 1910 it had a high sugar content, low acid, and mild flavor. The fruit is like Catawba in type, and it is perhaps a seedling of this variety.

The seedling from Mr. N. Wagner, Brownhelm, Ohio, showed remarkably high sugar and low acid for the year 1909. No sample was secured in 1910.

The sample from Mr. H. Kummel, Middle Bass Island, Ohio, shows only a fair amount of sugar, but the acid is low and the flavor very good, being mild and vinous. The fruit is black, and the bunches compact, of the Norton type. Such a grape might be desirable to mix with Clinton or Norton.

The seedling secured from Mr. H. Beatty, Kelleys Island, Ohio, showed very high sugar for 1910, and low acid in both years. It has loose bunches, black fruit with white juice, is mild in flavor, and might be desirable for blending. Its parentage is unknown.

From Mr. J. Schonhardt, Venice, Ohio, two samples were obtained, numbered 8 and 9 in the table. No. 8 is like Concord in type of bunch and in color, but is very much higher in sugar content, with a

moderately low acid. No. 9 is Catawba in type, with a remarkably high sugar and low acid. If these last have such growth characteristics as to render their culture practicable they can not fail to be of commercial value.

Sugar and acid content of seedlings or unknown varieties.

Seedling No.	Field No.	Grower and address.	Date of sampling.	Total sugar as invert.		Acid as tartaric.	
				Grams.	Percent.	Grams.	Percent.
1	195	N. Schneider, Vermilion, Ohio	Oct. 7, 1909	21.21	19.42	0.979	0.897
1	91	.....do.....	Sept. 24, 1910	20.00	18.40	1.144	1.053
1	204	.....do.....	Oct. 2, 1910	19.95	18.35	1.005	.925
2	122	E. L. Steuk, Venice, Ohio.....	Oct. 1, 1909	19.52	17.99	.521	.480
2	179	.....do.....	Oct. 6, 1909	17.41	16.21	.473	.440
2	241	.....do.....	Oct. 9, 1909	18.75	18.43	.450	.416
2	50	.....do.....	Sept. 16, 1910	19.96	17.42	.529	.418
2	131	.....do.....	Sept. 26, 1910	22.37	20.45	.439	.401
3	361	J. H. Bauman, Kelleys Island, Ohio..	Oct. 20, 1909	20.43	18.76	.938	.861
4	491	L. C. Dodge, Middle Bass, Ohio.....	Oct. 27, 1909	13.44	12.64	1.301	1.223
4	53	.....do.....	Sept. 17, 1910	19.91	18.32	.743	.684
5	331	N. Wagner, Brownhelm, Ohio.....	Oct. 17, 1909	19.08	17.56	.754	.694
6	203	H. Kummel, Middle Bass, Ohio.....	Oct. 7, 1909	18.37	16.90	.514	.473
6	69	.....do.....	Sept. 21, 1910	17.50	16.25	.664	.616
7	71	H. Beatty, Kelleys Island, Ohio.....	Sept. 24, 1909	18.41	17.05	.656	.607
7	345	.....do.....	Oct. 8, 1910	24.39	22.13	.626	.568
8	41	J. Schonhardt, Venice, Ohio.....	Sept. 16, 1910	22.43	20.45	.845	.763
9	229	.....do.....	Oct. 3, 1910	26.11	23.54	.683	.616

GRAPES GROWN IN VIRGINIA, 1908-1910.

Formerly Charlottesville, Va., was a grape-growing center of considerable importance, but the very destructive ravages of black rot from 1886 to 1890, before the present methods of controlling this disease were developed, among other factors resulted in greatly reducing the area of grapes in cultivation. There remains, however, a small but important industry which is confined chiefly to growing Norton grapes for wine in the Piedmont section of Virginia. This district is the natural home of the Norton, where, under careful cultivation, it grows to a perfection seldom reached elsewhere. With the exception of this variety, the grape-growing industry is of very little importance in the Virginia Piedmont. During the years 1909 and 1910, however, samples were obtained of all of the other varieties obtainable from the local wine cellars at Charlottesville.

The Norton is, when matured properly, such a valuable grape for red wine and for grape-juice manufacture that it is worthy of a thorough investigation. There is also every reason to believe that most of the commonly grown American grapes can be produced in the Virginia Piedmont of a quality quite equal to those of other sections, but the results show that at present this is not done. However, in the case of the Norton the high content of sugar and the low acid indicate a grape superior, in the main, to the samples of this variety from other districts.

The climate and soil conditions of the Virginia Piedmont are so different from those of the northern grape belt that it seems best to present the results for this district in a separate table. It is intended to extend the investigation of the composition of grapes grown in the Atlantic Coast States so as to cover the territory more thoroughly and to secure a larger number of samples. The data here presented are not sufficient to warrant conclusions, but they are interesting and show the possibility of producing a very high quality in at least some of the black grapes grown in this section.

The samples analyzed at the Stonehenge Laboratory were obtained through the courtesy of Mr. A. Russow, of the Monticello Wine Co., and were taken by him from the fruit brought to the wine cellar at vintage time. It was endeavored to make the sample represent the crop as delivered.

For 1908 only samples of Norton were obtained. These show a very high average sugar content and an average acid content of less than 1 per cent. This is certainly a high quality and warrants the statement that such a juice needs very little change in composition for wine making. The maximum sugar content found of 22.34 per cent, with 0.902 of total acid, is phenomenal for a strictly American grape. A comparison of the three years' results on Norton shows that the same vineyard has in each year yielded the maximum quality, the average for the three years being above 22 per cent of sugar and 8 per mille of acid (i. e., per thousand, or 0.8 per cent). In several instances the sampling of the Norton grapes covers a period of from four to seven days, yet there is no marked difference shown in composition. The question of the changes in percentage of acid and sugar in the grapes grown in this district needs a thorough investigation.

During 1909 and 1910 the sampling of several crops of Concord grapes also covered a period from four to seven days, and decided improvement was shown in some of these crops during this time, while in other cases it was slight. The sampling of several crops of Ives for like periods shows no decided results in favor of the later pickings, and in some cases a deterioration is indicated. These data are by no means to be accepted as proof that the crops actually deteriorated. The question needs a careful investigation of reserved vines, which can be studied for a much longer period, before it can be definitely answered. In the opinion of the writer none of the results for Concord and Ives show the quality which may be produced by thoroughly maturing these varieties. Table IV (p. 35) presents the average data obtained on these Virginia grapes.

TABULATION OF ANALYTICAL DATA ON SAMPLES COLLECTED AT SANDUSKY, OHIO.

DATA FOR 1908.

TABLE I.—Average, maximum, and minimum data for 1908, arranged by varieties and localities. (Analyses by Hartmann and Eoff.)

[Results expressed in grams per 100 cc of expressed juice.]

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
BACCHUS.															
Vermilion, Ohio.....	2	1	22.1	23.28	23.46	23.09	2.77	2.82	2.72	20.51	20.74	20.27	1.205	1.215	1.196
CATAWBA.															
Kelleys Island, Ohio....	14	10	21.2	22.98	24.67	21.83	2.21	2.39	1.94	20.77	22.73	19.48	.825	1.013	.675
Middle Bass, Ohio.....	1	1	19.9	21.70			2.13			19.57			.743		
North Bass, Ohio.....	1	1	19.3	20.89			2.09			18.80			.855		
Port Clinton, Ohio.....	2	2	21.6	22.42	23.25	21.59	2.11	2.23	2.00	20.30	21.02	19.59	.769	.788	.750
Put in Bay, Ohio.....	6	6	21.1	22.74	24.57	21.59	2.23	2.70	1.87	20.51	22.70	19.57	.839	.971	.668
Vermilion, Ohio.....	1	1	19.1	20.41			2.00			18.41			.638		.668
Averages, limits, and totals.....	25	21	20.9	22.64	24.67	21.59	2.19	2.70	1.87	20.45	22.73	19.48	.775	1.013	.668
CLINTON.															
Huron, Ohio.....	3	1	22.5	23.45	24.04	22.54	2.64	2.81	2.49	20.81	21.43	19.73	.975	1.125	.863
North Bass, Ohio.....	1	1	18.9	19.21			2.78			16.43			1.265		
Vermilion, Ohio.....	1	1	19.7	20.07			2.56			17.51			1.215		
Averages, limits, and totals.....	5	3	21.2	21.93	24.04	22.54	2.65	2.81	2.49	19.28	21.43	19.73	1.081	1.125	.865
CONCORD.															
Berlin Heights, Ohio....	1	1	19.8	20.73			1.85			18.80			.473		
Brownhelm, Ohio.....	1	1	18.2	18.74			1.68			17.06			.488		
Kelleys Island, Ohio.....	2	2	19.5	20.57	20.83	20.31	1.90	2.29	1.51	18.67	19.32	18.02	.426	.473	.379
Marblehead, Ohio.....	1	1	17.2	18.16			1.21			16.95			.349		
North Bass, Ohio.....	2	2	18.6	19.89	20.07	19.52	1.69	1.79	1.59	18.10	18.48	17.73	.488	.578	.398
Sandusky, Ohio.....	1	1	17.6	17.83			2.08			15.75			.454		
Vermilion, Ohio.....	2	2	17.6	18.74	20.60	16.88	1.74	2.03	1.46	16.99	18.57	15.42	.495	.521	.469
Locality not given.....	1	1	16.7	16.70			1.40			15.30			.544		
Averages, limits, and totals.....	11	11	18.3	19.12	20.83	16.88	1.72	2.29	1.46	17.40	19.32	15.42	.466	.578	.379
DELAWARE.															
North Bass, Ohio.....	2	1	24.8	27.27	28.46	26.09	2.03	2.28	1.78	25.24	26.18	24.31	.467	.495	.439
IONA.															
Vermilion, Ohio.....	1	1	21.6	23.30			2.21			21.09			.679		
ISABELLA.															
Kelleys Island, Ohio....	2	2	20.3	21.83	21.86	21.80	1.95	2.03	1.86	19.89	19.94	19.83	.540	.650	.424
IVES.															
Catawba Island, Ohio....	1	1	16.6	17.64			1.80			15.84			.379		
Ceylon, Ohio.....	4	3	17.0	18.37	18.66	16.13	1.87	1.98	1.75	15.49	16.91	14.28	.553	.608	.461
Danbury, Ohio.....	2	2	17.4	18.28	19.00	17.56	2.05	2.06	2.04	16.23	16.96	15.50	.506	.525	.488
Huron, Ohio.....	3	2	19.1	21.19	22.72	18.48	2.09	2.46	1.50	19.10	21.22	16.16	.490	.555	.375
Marblehead, Ohio.....	1	1	16.8	17.48			1.88			15.60			.514		
Put in Bay, Ohio.....	2	1	17.2	18.03	18.14	17.93	2.09	2.40	1.78	15.94	16.36	15.53	.603	.776	.431
Vermilion, Ohio.....	6	6	16.7	17.16	19.68	15.71	1.96	2.11	1.79	15.19	17.74	13.62	.510	.551	.431
Averages, limits, and totals.....	19	16	17.9	18.09	22.72	15.71	1.97	2.46	1.50	16.12	21.22	13.62	.519	.776	.375

TABLE I.—Average, maximum, and minimum data for 1908, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
MONTEFIORE.															
Kelleys Island, Ohio	1	1	(1)	26.62	.....	.....	1.82	.....	.....	24.80	.....	.....	.401	.....	.....
NORTON.															
Huron, Ohio	1	1		25.4	27.17	.....	3.05	.....	.....	24.12	.....	.....	1.013	.....	.....
Kelleys Island, Ohio	1	1		28.6	30.55	.....	3.23	.....	.....	27.32	.....	.....	1.010	.....	.....
Venice, Ohio	1	1		25.4	27.38	.....	3.00	.....	.....	24.38	.....	.....	.994	.....	.....
Averages, limits, and totals	3	3		26.5	28.37	.....	3.09	.....	.....	25.27	.....	.....	1.006	.....	.....
RIESLING.															
Kelleys Island, Ohio	1	1		20.65	.....	.....	2.08	.....	.....	18.57	.....	.....	.656	.....	.....
SCHRAIDT.															
North Bass, Ohio	1	1		21.20	.....	.....	2.97	.....	.....	18.23	.....	.....	1.294	.....	.....
SEEDLING (SCHNEIDER) ..															
Vermilion, Ohio	1	1		25.9	28.17	.....	2.33	.....	.....	25.84	.....	.....	.540	.....	.....

¹ Brix not read.**DATA FOR 1909.**

TABLE II.—Average, maximum, and minimum data for 1909, arranged by varieties and localities. (Analyses by Hartmann and Eoff.)

[Results expressed in grams per 100 cc of expressed juice.]

Variety and locality.	Number of samples.	Number of growers.	Average Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
AGAWAM.															
North East, Pa.	1	1	16.7	17.69	.....	.....	2.15	.....	.....	15.54	.....	.....	1.043	.....	.....
Ripley, N. Y.	1	1	(1)	22.07	.....	.....	1.81	.....	.....	22.26	.....	.....	.638	.....	.....
Averages, limits, and totals.	2	2 ²	16.7	19.88	.....	.....	1.98	.....	.....	17.90	.....	.....	.840	.....	.....
BACCHUS.															
Kelleys Island, Ohio.	1	1	21.0	23.12	.....	.....	4.21	.....	.....	18.91	.....	.....	1.996	.....	.....
Middle Bass, Ohio.	3	3	21.9	24.37	25.17	23.51	4.22	4.30	4.16	20.15	21.01	19.30	1.587	1.816	1.620
North Bass, Ohio.	1	1	(1)	22.20	.....	.....	4.10	.....	.....	18.10	.....	.....	2.156	.....	.....
Sandusky, Ohio ³	1	1	22.6	25.09	.....	.....	4.56	.....	.....	20.53	.....	.....	1.672	.....	.....
Brocton, N. Y.	1	1	21.4	22.83	.....	.....	3.33	.....	.....	18.50	.....	.....	1.936	.....	.....
Averages, limits, and totals.	7	7 ⁴	21.8	23.76	25.17	23.51	4.12	4.30	4.16	19.64	21.01	19.30	1.852	1.816	1.620

¹ Brix not read.² One sample.³ A. Schmidt, jr., & Bros.⁴ Only 6 samples.

TABLE II.—Average, maximum, and minimum data for 1909, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Average Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
BRIGHTON.															
Put in Bay, Ohio.....	1	1	18.9	20.62	.....	.....	2.25	.....	.....	18.37	.....	.....	.653	.....	.....
Venice, Ohio.....	1	1	(1)	25.30	.....	.....	2.73	.....	.....	22.57	.....	.....	.611	.....	.....
Averages, limits, and totals.....	2	2	18.9	22.96	.....	.....	2.49	.....	.....	20.47	.....	.....	.632	.....	.....
CAMPBELL'S EARLY.															
Kelleys Island, Ohio.....	1	1	(1)	15.94	.....	.....	2.33	.....	.....	13.61	.....	.....	.784	.....	.....
CLINTON.															
Brownhelm, Ohio.....	2	1 ²	22.1	21.95	24.59	19.31	4.23	4.26	4.21	17.72	20.38	15.05	1.935	2.130	1.740
Huron, Ohio.....	1	1	(1)	25.67	.....	.....	3.89	.....	.....	21.78	.....	.....	1.456	.....	.....
Middle Bass, Ohio.....	2	1	22.0	24.27	.....	.....	3.84	.....	.....	20.43	.....	.....	1.730	.....	.....
North Bass, Ohio.....	2	2	(1)	22.43	21.41	20.44	3.56	3.66	3.47	17.36	17.75	16.97	1.755	1.808	1.702
Sandusky, Ohio ³	1	1	22.1	25.17	.....	.....	4.88	.....	.....	20.29	.....	.....	1.726	.....	.....
Sandusky, Ohio ⁴	1	1	20.0	21.78	.....	.....	3.87	.....	.....	17.91	.....	.....	1.628	.....	.....
Venice, Ohio.....	4	2 ³	18.7	18.92	19.97	17.83	4.05	4.26	3.82	14.87	15.76	14.01	1.568	1.932	1.309
North East, Pa.....	1	1	22.1	24.70	.....	.....	4.64	.....	.....	20.06	.....	.....	2.220	.....	.....
Bluff Point, N. Y.....	2	1	21.2	23.30	24.91	21.70	4.18	4.19	4.18	19.12	20.72	17.52	1.946	2.070	1.822
Brocton, N. Y.....	1	1	18.9	20.49	.....	.....	4.03	.....	.....	16.46	.....	.....	2.130	.....	.....
Averages, limits, and totals.....	17	12	20.9	22.07	24.91	17.83	4.08	4.26	3.47	17.80	20.72	14.01	1.777	1.808	1.309
CATAWBA.															
Brownhelm, Ohio.....	2	2	19.7	21.96	23.07	20.86	3.27	3.76	2.79	18.69	19.31	18.07	1.203	1.316	1.091
Danbury, Ohio.....	1	1	19.1	20.49	.....	.....	2.73	.....	.....	17.76	.....	.....	1.486	.....	.....
Euclid, Ohio.....	1	1	(1)	19.63	.....	.....	2.87	.....	.....	16.76	.....	.....	1.249	.....	.....
Kelleys Island, Ohio.....	7	7	19.3	20.98	22.25	19.34	2.90	3.66	2.41	18.09	19.31	16.93	1.278	1.384	1.163
Middle Bass, Ohio.....	9	5 ¹	19.7	21.13	23.20	19.60	2.49	2.82	2.32	18.63	20.88	17.15	1.033	1.174	.881
North Bass, Ohio.....	7	7	19.9	21.69	23.35	18.84	2.50	3.18	2.03	19.18	21.32	16.38	1.024	1.181	.844
Put in Bay, Ohio.....	17	13 ⁷	19.0	20.83	22.80	18.48	2.70	3.32	2.11	18.14	19.68	15.97	1.096	1.335	.960
Sandusky, Ohio:															
American Wine Co.....	16	1 ⁸	19.0	20.80	21.04	20.39	2.85	3.62	2.23	18.01	18.81	16.77	1.175	1.552	.945
Bass Island Vineyard Co.....	7	1 ⁹	19.2	20.60	21.46	19.79	2.84	3.60	2.14	17.76	18.84	16.19	1.291	1.702	.866
Duroy & Haines.....	4	1	18.9	20.77	22.15	19.44	2.77	3.10	2.40	18.01	19.05	16.35	1.120	1.256	.968
Engels & Krudwig.....	1	1	20.3	22.16	.....	.....	3.58	.....	.....	18.57	.....	.....	1.226	.....	.....
A. Schmidt, jr., & Bros.....	3	1	17.2	18.27	19.00	17.09	2.15	2.17	2.13	16.12	16.86	14.92	1.113	1.181	1.058
Sweet Valley Wine Co.....	3	1	18.0	19.18	21.15	18.01	2.33	2.47	2.16	16.86	18.68	15.85	1.190	1.238	1.163
Venice, Ohio.....	6	5 ¹⁰	19.3	20.37	23.13	18.92	2.82	3.22	2.25	17.55	20.11	15.73	1.207	2.432	1.058
North East, Pa.....	3	3	17.4	19.01	19.60	18.40	3.01	3.21	2.89	16.00	16.66	15.51	1.527	1.642	1.410
Brocton, N. Y.....	2	2	16.8	17.86	19.26	16.47	3.07	3.55	2.59	14.79	16.67	12.92	1.792	1.972	1.612
Ripley, N. Y.....	1	1	19.2	21.07	.....	.....	2.29	.....	.....	18.78	.....	.....	1.144	.....	.....
Sheridan, N. Y.....	1	1	17.9	19.42	.....	.....	2.20	.....	.....	17.22	.....	.....	(11)	.....	.....
Averages, limits, and totals.....	91	54	19.0	22.80	23.35	16.47	2.72	3.76	2.03	17.91	20.11	12.92	1.167	2.432	.844
CONCORD.															
Brownhelm, Ohio.....	3	3 ²	17.8	17.58	18.97	16.68	2.48	2.86	1.90	15.10	17.07	14.01	.841	.930	.698
Catawba Island, Ohio.....	1	1	16.9	17.75	.....	.....	2.03	.....	.....	15.72	.....	.....	.533	.....	.....
Danbury, Ohio.....	6	4 ²	16.2	17.66	19.81	16.52	2.32	2.56	1.84	15.33	17.25	14.50	.672	.803	.555
Euclid, Ohio.....	1	1	(1)	19.79	.....	.....	2.73	.....	.....	17.42	.....	.....	.626	.....	.....
Gypsum, Ohio.....	1	1	17.9	18.19	.....	.....	2.30	.....	.....	15.89	.....	.....	.533	.....	.....
Kelleys Island, Ohio.....	4	2 ⁹	18.8	20.07	21.81	19.08	2.16	2.85	1.81	17.91	19.99	16.49	.629	.776	.525
Middle Bass, Ohio.....	4	4	16.5	18.04	19.84	16.99	2.08	2.59	1.84	15.98	18.00	14.40	12.720	.....	.....
Noble, Ohio.....	1	1	(1)	18.08	.....	.....	2.66	.....	.....	15.42	.....	.....	.634	.....	.....
North Bass, Ohio.....	4	4 ²	18.2	18.33	19.44	17.25	2.50	3.07	1.61	15.84	16.81	14.88	.752	1.050	.461

¹ Brix not read.² One sample.³ Engels & Krudwig.⁴ A. Schmidt, jr., & Bros.⁵ Eight samples.⁶ Five samples.⁷ Sixteen samples.⁸ Twelve samples.⁹ Three samples.¹⁰ Four samples.¹¹ Acid not made.¹² One acid given.

TABLE II.—Average, maximum, and minimum data for 1909, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Average Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
CONCORD—Continued.															
Port Clinton, Ohio.....	3	3	16.6	17.00	17.20	16.60	1.96	2.25	1.80	15.04	15.37	14.80	0.611	0.660	0.566
Put in Bay, Ohio.....	2	2	18.3	19.46	20.49	18.43	1.97	1.99	1.95	17.49	18.50	16.48	.645	.690	.600
Sandusky, Ohio:															
Bass Island Vineyard	1	1	17.3	18.32	.....	.....	2.55	.....	.....	15.77	.....	.....	.739	.....	.....
Co.....	1	1	17.0	18.32	.....	.....	2.66	.....	.....	15.66	.....	.....	.713	.....	.....
Engels & Krudwig.....	1	1	(1)	15.50	.....	.....	1.90	.....	.....	13.60	.....	.....	.930	.....	.....
Sweet Valley Wine Co.	1	1	16.7	17.80	.....	.....	1.96	.....	.....	15.84	.....	.....	.724	.....	.....
Jno. Dorn.....	12	11	17.8	18.74	21.23	16.65	2.39	2.79	1.74	16.35	18.44	14.22	3.742	.968	.521
Venice, Ohio.....	9	9	17.0	18.19	19.94	16.23	2.02	2.37	1.77	16.17	17.85	14.22	.874	1.076	.716
North East, Pa.....	3	3	17.9	18.82	19.86	17.62	1.81	1.91	1.71	17.00	18.04	15.91	.729	.975	.488
Bluff Point, N. Y.....	2	2	17.3	18.39	18.56	18.22	2.06	2.29	1.84	16.32	16.72	15.93	.847	1.046	.649
Brocton, N. Y.....	2	2	16.7	17.77	17.93	17.62	1.79	1.80	1.78	15.98	16.13	15.84	.613	.645	.581
Hammondsport, N. Y.....	3	3	16.3	17.07	17.85	16.23	1.88	1.92	1.81	15.20	15.95	14.42	.753	.814	.705
Keuka, N. Y.....	1	1	16.7	17.64	.....	.....	2.15	.....	.....	15.49	.....	.....	.716	.....	.....
Penn Yan, N. Y.....	1	1	15.5	15.84	.....	.....	1.80	.....	.....	14.04	.....	.....	.615	.....	.....
Pulteney, N. Y.....	3	3	16.8	17.82	19.05	16.47	1.91	2.03	1.83	15.91	17.18	14.64	4.827	.915	.739
Ripley, N. Y.....	1	1	(1)	17.90	.....	.....	1.99	.....	.....	15.91	.....	.....	.829	.....	.....
Sheridan, N. Y.....	3	3	16.8	17.82	19.05	16.47	1.91	2.03	1.83	15.91	17.18	14.64	4.827	.915	.739
Wayne, N. Y.....	2	2	16.9	17.80	17.80	17.80	1.70	1.79	1.61	16.10	16.19	16.01	.690	.735	.645
Westfield, N. Y.....	3	3	16.3	17.31	18.06	16.23	2.14	2.41	2.00	15.17	16.06	14.22	.893	.990	.799
Averages, limits, and totals.....	76	67	17.0	18.14	21.81	16.23	2.15	3.07	1.61	15.99	19.99	14.01	.748	1.076	.461
CYNTHIANA.															
Put in Bay, Ohio.....	1	1	(1)	24.14	.....	.....	5.04	.....	.....	19.10	.....	.....	1.598	.....	.....
DELAWARE.															
Brownhelm, Ohio.....	1	1	24.2	26.70	.....	.....	2.22	.....	.....	24.28	.....	.....	.705	.....	.....
Danbury, Ohio.....	1	1	(1)	19.44	.....	.....	2.70	.....	.....	16.65	.....	.....	.908	.....	.....
Euclid, Ohio.....	1	1	(1)	20.89	.....	.....	2.74	.....	.....	18.15	.....	.....	.803	.....	.....
Kelleys Island, Ohio.....	2	1	22.1	24.25	24.30	24.20	2.21	2.45	1.97	22.04	22.23	21.85	.765	.878	.653
Middle Bass, Ohio.....	7	7	(1)	22.81	24.99	21.02	2.00	2.13	1.89	20.81	23.04	18.89	4.773	.818	.728
Noble, Ohio.....	1	1	(1)	24.04	.....	.....	2.59	.....	.....	21.45	.....	.....	.791	.....	.....
North Bass, Ohio.....	5	5	22.7	23.31	25.07	22.78	2.25	3.21	2.19	21.47	23.34	20.50	.823	1.031	.641
Sandusky, Ohio:															
Sweet Valley Wine Co.	2	1	21.3	23.09	25.43	20.45	2.32	2.46	2.19	20.76	23.24	18.29	.735	.739	.731
Venice, Ohio.....	2	2	(1)	25.21	27.12	23.20	2.86	2.89	2.84	22.34	24.28	20.41	.943	1.031	.855
North East, Pa.....	2	2	21.8	24.07	25.49	22.65	2.55	2.67	2.43	21.54	22.82	20.22	1.022	1.061	.983
Bluff Point, N. Y.....	2	2	20.7	22.46	22.72	22.20	2.34	2.89	1.80	20.11	20.92	19.31	.758	.788	.728
Brocton, N. Y.....	1	1	20.2	22.17	.....	.....	2.94	.....	.....	19.23	.....	.....	1.016	.....	.....
Hammondsport, N. Y.....	3	3	20.5	21.99	22.86	21.04	1.96	2.10	1.85	20.03	20.92	19.19	.765	.803	.716
Penn Yan, N. Y.....	1	1	21.6	23.88	.....	.....	2.84	.....	.....	21.04	.....	.....	.934	.....	.....
Pulteney, N. Y.....	1	1	20.5	21.75	.....	.....	2.05	.....	.....	19.70	.....	.....	.881	.....	.....
Ripley, N. Y.....	1	1	18.4	19.05	.....	.....	1.95	.....	.....	17.10	.....	.....	.788	.....	.....
Sheridan, N. Y.....	1	1	21.0	22.93	.....	.....	2.20	.....	.....	20.73	.....	.....	.806	.....	.....
Wayne, N. Y.....	1	1	20.9	22.75	.....	.....	2.13	.....	.....	20.62	.....	.....	.821	.....	.....
Westfield, N. Y.....	1	1	17.3	18.56	.....	.....	2.36	.....	.....	16.20	.....	.....	.840	.....	.....
Averages, limits, and totals.....	36	34	20.9	22.97	25.49	20.45	2.36	3.21	1.80	20.61	24.28	19.19	.829	1.061	.641
DIANA.															
Kelleys Island, Ohio....	1	1	20.1	22.07	.....	.....	2.17	.....	.....	19.90	.....	.....	.950	.....	.....
ELVIRA.															
Kelleys Island, Ohio....	1	1	19.1	20.05	.....	.....	1.98	.....	.....	18.07	.....	.....	.765	.....	.....
Middle Bass, Ohio.....	4	4	(1)	16.08	17.85	14.64	2.25	2.45	1.98	13.82	15.87	12.40	.908	1.095	.656
North Bass, Ohio.....	2	2	(1)	16.41	18.32	14.51	2.51	3.25	2.78	13.40	15.07	11.13	1.277	1.354	1.200
Venice, Ohio.....	1	1	(1)	17.17	.....	.....	3.00	.....	.....	14.17	.....	.....	1.069	.....	.....
Averages, limits, and totals.....	8	8	19.1	16.66	18.32	14.51	2.50	3.25	1.98	14.29	15.87	11.13	1.002	1.354	.656

¹ Brix not read.² Four samples.³ Ten acids given.⁴ Two acids given.⁵ On one sample.

TABLE II.—Average, maximum, and minimum data for 1909, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Average Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
ETTA.															
North Bass, Ohio.....	1	1	13.9	14.20			2.96			11.24			1.369		
GREENS EARLY.															
Kelleys Island, Ohio	1	1	(1)	18.45			4.24			14.21			.758		
GUT EDEL.															
Kelleys Island, Ohio	1	1	21.9	23.77			3.57			20.20			1.144		
HAYS.															
Put in Bay, Ohio.....	1	1	(1)	20.94			2.79			18.45			.893		
HARTFORD.															
Middle Bass, Ohio.....	1	1	19.1	19.60			2.04			17.56			(2)		
IONA.															
Kelleys Island, Ohio	2	2	19.9	21.90	22.36	21.44	2.27	2.67	1.87	19.63	20.49	18.77	.806	.855	.758
Put in Bay, Ohio.....	1	1	19.3	21.83			3.02			18.81			.851		
Brocton, N. Y.....	1	1	21.0	23.14			2.07			21.07			.881		
Averages, limits, and totals.....	4	4	20.0	22.19	22.36	21.44	2.41	2.67	1.87	19.78	20.49	18.77	.836	.855	.758
ISABELLA.															
Euclid, Ohio.....	1	1	(1)	15.55			2.22			13.33			.821		
Marblehead, Ohio.....	1	1	(1)	13.13			2.21			10.92			1.084		
North East, Pa.....	1	1	14.9	15.94			2.44			13.37			1.140		
Bluff Point, N. Y.....	2	2	16.6	17.60	17.67	17.54	2.09	2.16	2.02	15.51	15.52	15.51	.872	.874	.870
Brocton, N. Y.....	1	1	16.2	17.25			2.57			14.68			1.249		
Averages, limits, and totals.....	6	6	16.1	16.18	17.67	17.54	2.27	2.16	2.02	13.91	15.52	15.51	1.008	.874	.870
IVES.															
Brownhelm, Ohio.....	3	2 ³	17.5	18.73	19.44	17.64	3.05	3.45	2.53	15.68	15.99	15.11	.935	1.118	.720
Huron, Ohio.....	2	2 ³	17.6	18.04	19.29	16.80	2.71	2.97	2.45	15.33	16.32	14.35	.637	.656	.619
Kelleys Island, Ohio.....	1	1	(1)	16.15			2.78			13.37			.896		
Middle Bass, Ohio.....	2	2	16.7	17.78	19.00	16.57	2.53	2.79	2.28	15.25	16.21	14.29	.716	.784	.649
North Bass, Ohio.....	2	2 ³	14.3	14.79	15.03	14.56	2.20	2.30	2.11	12.59	12.73	12.45	.742	.765	.720
Sandusky, Ohio:															
Engels & Krudwig.....	3	1	16.7	17.94	18.69	16.62	2.63	2.79	2.50	15.31	16.19	14.03	.651	.743	.525
Sweet Valley Wine Co.	2	1	17.0	18.66	18.71	18.61	3.29	3.62	2.96	15.37	15.65	15.09	.744	.780	.709
John Dorn.....	1	1	18.9	20.81			3.83			16.98			.788		
A. Schmidt, jr., & Bros.....															
Put in Bay, Ohio.....	2	2	16.9	18.26	18.58	17.95	2.84	3.19	2.50	15.42	16.08	14.76	.697	.725	.559
Venice, Ohio.....	6	5	16.6	17.15	18.50	15.22	2.59	2.92	1.81	14.56	15.73	13.41	.815	.994	.716
Vermilion, Ohio.....	3	2 ³	17.4	17.30	17.75	16.47	2.30	2.73	2.04	15.00	15.71	13.74	.775	.844	.664
North East, Pa.....	1	1	12.6	13.39			2.22			11.17			.776		
Hammondsport, N. Y.....	1	1	14.9	15.35			1.88			13.47			.683		
Pulteney, N. Y.....	1	1	12.3	12.92			2.16			10.76			.904		
Averages, limits, and totals.....	31	25	16.4	17.39	19.44	14.56	2.67	3.62	1.81	14.72	16.32	12.45	.768	1.118	.619
MARTHA.															
Brocton, N. Y.....	1	1	17.2	18.06			1.99			16.07			.840		

¹ Brix not read.² Acid not made.³ One sample.⁴ Two samples.⁵ Four acids given.

TABLE II.—Average, maximum, and minimum data for 1909, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Average Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
MARION.															
North Bass, Ohio.....	1	1	23.1	25.17	.....	.....	4.40	.....	.....	20.77	.....	.....	1.718	.....	.....
MONTEFIORE.															
Kelleys Island, Ohio.....	2	1 ¹	18.0	21.21	23.35	19.08	2.68	3.22	2.16	18.52	20.13	16.92	.771	1.073	.469
Put in Bay, Ohio.....	1	1	(²)	24.54	.....	.....	3.27	.....	.....	21.27	.....	.....	.780	.....	.....
Venice, Ohio.....	1	1	(²)	24.54	.....	.....	3.04	.....	.....	21.51	.....	.....	.645	.....	.....
Averages, limits, and totals.....	4	3	18.0	22.88	23.35	19.08	2.92	3.22	2.16	19.96	20.13	16.92	.842	1.073	.469
NIAGARA.															
Brownhelm, Ohio.....	1	1	(²)	21.36	.....	.....	2.99	.....	.....	18.37	.....	.....	.713	.....	.....
Danbury, Ohio.....	1	1	(²)	15.63	.....	.....	2.66	.....	.....	12.97	.....	.....	.585	.....	.....
Euclid, Ohio.....	1	1	(²)	15.32	.....	.....	2.58	.....	.....	12.74	.....	.....	.551	.....	.....
Kelleys Island, Ohio.....	1	1	16.9	18.30	.....	.....	1.80	.....	.....	16.50	.....	.....	.585	.....	.....
Middle Bass, Ohio.....	1	1	(²)	18.74	.....	.....	3.17	.....	.....	15.57	.....	.....	.675	.....	.....
North Bass, Ohio.....	1	1	(²)	15.61	.....	.....	2.68	.....	.....	12.93	.....	.....	.581	.....	.....
North East, Pa.....	3	3	18.3	19.57	20.02	19.31	1.92	2.06	1.83	17.65	17.96	17.43	.781	.829	.746
Bluff Point, N. Y.....	2	1	16.1	16.74	17.93	15.55	1.48	1.80	1.16	15.76	16.13	14.39	.501	.664	.338
Brocton, N. Y.....	1	1	18.3	20.12	.....	.....	2.00	.....	.....	18.12	.....	.....	.690	.....	.....
Ripley, N. Y.....	3	3	16.6	17.72	18.16	17.33	1.84	1.93	1.80	15.88	16.23	15.53 ³	.665	.731	.599
Westfield, N. Y.....	1	1	15.7	16.44	.....	.....	3.30	.....	.....	13.14	.....	.....	.780	.....	.....
Averages, limits, and totals.....	16	15	17.1	17.93	20.02	15.55	2.22	2.06	1.16	15.72	17.96	14.39	.615	.829	.338
NORTON.															
Euclid, Ohio.....	1	1	(²)	25.85	.....	.....	3.34	.....	.....	22.51	.....	.....	1.456	.....	.....
Kelleys Island, Ohio.....	1	1	19.5	20.94	.....	.....	3.25	.....	.....	17.69	.....	.....	1.770	.....	.....
Middle Bass, Ohio.....	2	2	21.3	22.29	22.88	21.70	4.49	4.79	4.18	17.80	18.70	16.91	1.896	1.912	1.880
North Bass, Ohio.....	2	2	(²)	21.84	21.94	21.75	4.46	4.72	4.21	17.38	17.54	17.22	1.718	1.740	1.696
Put in Bay, Ohio.....	2	1 ¹	22.0	23.79	23.91	23.67	4.21	4.23	4.19	19.58	19.68	19.48	1.864	1.912	1.816
Sandusky, Ohio:															
Engels & Krudwig.....	1	1	25.4	27.96	.....	.....	6.13	.....	.....	21.83	.....	.....	1.996	.....	.....
Venice, Ohio.....	2	2	24.2	26.70	26.78	26.63	5.20	5.51	4.90	21.50	21.72	21.27	1.917	2.078	1.756
Averages, limits, and totals.....	11	10	22.5	24.00	26.78	21.70	4.49	5.51	4.18	19.50	21.72	16.91	1.812	2.078	1.696
POCKLINGTON.															
Put in Bay, Ohio.....	1	1	17.8	19.26	.....	.....	2.70	.....	.....	16.80	.....	.....	.926	.....	.....
Venice, Ohio.....	1	1	17.9	19.55	.....	.....	2.51	.....	.....	17.26	.....	.....	.656	.....	.....
Ripley, N. Y.....	1	1	(²)	18.19	.....	.....	1.72	.....	.....	16.15	.....	.....	.518	.....	.....
Averages, limits, and totals.....	3	3	17.8	19.00	.....	.....	2.31	.....	.....	16.85	.....	.....	.700	.....	.....
RIESLING.															
Brownhelm, Ohio.....	1	1	(²)	21.88	.....	.....	2.94	.....	.....	18.94	.....	.....	1.181	.....	.....
Kelleys Island, Ohio.....	2	2	19.8	21.61	22.65	20.57	2.42	2.47	2.38	19.18	20.18	18.19	.750	.825	.675
Averages, limits, and totals.....	3	3	19.8	21.70	22.65	20.57	2.59	2.47	2.38	19.13	20.18	18.19	.894	.825	.675
ROGERS.															
Brocton, N. Y.....	1	1	18.6	20.23	.....	.....	2.13	.....	.....	18.10	.....	.....	1.035	.....	.....
SALEM.															
North Bass, Ohio.....	1	1	(²)	19.21	.....	.....	1.60	.....	.....	17.61	.....	.....	.510	.....	.....

¹ One sample.² Brix not read.³ Two acids given.

TABLE II.—Average, maximum, and minimum data for 1909, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Average Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
SCHRAIDT.															
Middle Bass, Ohio.	2	2	20.2	22.37	22.88	21.86	4.95	5.74	4.17	17.41	17.69	17.14	1.853	2.040	1.666
North Bass, Ohio.	1	1	(1)	21.70	.....	.....	4.02	.....	.....	17.68	.....	.....	1.726	.....	.....
Averages, limits, and totals.	3	3	20.2	22.15	22.88	21.86	4.64	5.74	4.17	17.50	17.69	17.14	1.823	2.040	1.666
UNKNOWN GRAPES.															
Brownhelm, Ohio.	1	1	20.1	22.57	.....	.....	3.49	.....	.....	18.08	.....	.....	.754	.....	.....
Kelleys Island, Ohio.	2	2	(1)	21.98	23.22	20.75	2.56	2.79	2.34	19.42	20.43	18.41	.797	.938	.656
Middle Bass, Ohio.	2	2	17.0	18.42	20.36	16.49	2.52	3.05	1.99	15.91	18.37	13.44	.908	1.301	.514
North Bass, Ohio.	1	1	20.3	21.10	.....	.....	3.71	.....	.....	17.39	.....	.....	1.365	.....	.....
Sandusky, Ohio: A. Schmidt, jr., & Bros.	1	.....	19.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.866	.....	.....
Venice, Ohio.	1	1	(1)	18.16	.....	.....	2.60	.....	.....	15.93	.....	.....	.679	.....	.....
Vermilion, Ohio.	1	1	21.5	23.83	.....	.....	2.65	.....	.....	21.21	.....	.....	.979	.....	.....
Averages, limits, and totals.	9	8	19.1	20.81	23.22	16.49	2.83	3.05	1.99	18.03	20.43	13.44	.898	1.310	.514
WILDER.															
Put in Bay, Ohio.	1	1	16.1	16.96	.....	.....	2.52	.....	.....	14.44	.....	.....	1.020	.....	.....
EARLY WORDEN.															
Put in Bay, Ohio.	1	1	(1)	19.68	.....	.....	2.90	.....	.....	17.02	.....	.....	.780	.....	.....
Venice, Ohio.	1	1	17.8	19.31	.....	.....	2.04	.....	.....	17.47	.....	.....	.638	.....	.....
Averages, limits, and totals.	2	2	17.8	19.49	.....	.....	2.47	.....	.....	17.24	.....	.....	.709	.....	.....
WOODRUFF RED.															
Middle Bass, Ohio.	1	1	(1)	17.27	.....	.....	2.93	.....	.....	14.34	.....	.....	.409	.....	.....

¹ Brix not read.

DATA FOR 1910.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities. (Analyses by Eoff and Treuthardt.)

[Results expressed in grams per 100 cc of expressed juice.]

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugarasinvert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
AGAWAM.															
Fredonia, N. Y.....	2	2	16.5	17.88	18.40	17.35	3.23	3.47	2.99	14.65	14.93	14.36	1.463	1.516	1.410
Geneva, N. Y.....	1	1	17.9	19.16			2.62			16.54			1.106		
Averages, limits, and totals.....	3	3	17.0	18.30	18.40	17.35	3.03	3.47	2.99	15.28	14.93	14.36	1.344	1.516	1.410
AMBER QUEEN.															
Geneva, N. Y.....	1	1	17.6	18.63			2.61			16.02			1.436		
AMERICA.															
Geneva, N. Y.....	1	1	18.6	19.65			2.71			16.94			1.043		
AMINIA.															
Geneva, N. Y.....	1	1	17.5	18.50			1.82			16.68			.821		
ADIRONDACK.															
Geneva, N. Y.....	1	1	11.9	12.35			2.16			10.19			.911		
BACCHUS.															
Kelleys Island, Ohio.....	1	1	23.1	25.38			3.27			22.11			1.714		
North Bass, Ohio.....	1	1	24.5	16.07			3.34			12.73			1.826		
Averages, limits, and totals.....	2	2	23.8	20.73			3.31			17.42			1.770		
BARRY.															
Geneva, N. Y.....	1	1	14.0	14.59			2.47			12.12			1.159		
BELL.															
Geneva, N. Y.....	1	1	20.1	21.78			3.00			18.78			1.114		
BIG EXTRA 19.															
Geneva, N. Y.....	1	1	16.5	17.01			3.10			13.91			1.466		
BLACK EAGLE.															
Geneva, N. Y.....	2	1	18.6	19.88	21.88	17.88	2.31	2.40	2.22	17.57	19.66	15.48	1.011	1.121	.900
BRIGHTON.															
Put in Bay, Ohio.....	1	1	17.8	18.90			2.50			16.40			.982		
Venice, Ohio.....	3	1 ¹	21.8	22.24	24.14	19.16	2.38	2.83	1.93	19.87	21.50	16.79	.713	.840	.630
Fredonia, N. Y.....	1	1	17.1	18.40			2.19			16.21			.900		
Geneva, N. Y.....	1	1	18.7	19.92			2.19			17.73			.803		
Pulteney, N. Y.....	1	1	21.3	23.07			2.33			20.74			.934		
Averages, limits, and totals.....	7	5	19.3	21.00	24.14	19.16	2.33	2.83	1.93	18.67	21.50	16.79	.822	.840	.630
BROWN.															
Geneva, N. Y.....	1	1	15.8	16.36			2.72			13.64			1.106		
BUTLER NO. 1.															
Geneva, N. Y.....	1	1	17.6	19.18			2.15			17.03			.833		

¹ One sample.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
CAMPBELL'S EARLY.															
Kelleys Island, Ohio.....	1	1	18.7	20.34	.....	.....	1.84	.....	.....	18.50	.....	.....	0.611	.....	.....
Middle Bass, Ohio.....	1	1	17.3	18.84	.....	.....	1.97	.....	.....	16.87	.....	.....	.641	.....	.....
Put in Bay, Ohio.....	1	1	15.2	15.74	.....	.....	2.28	.....	.....	13.46	.....	.....	1.042	.....	.....
Fredonia, N. Y.....	1	1	15.4	16.31	.....	.....	2.90	.....	.....	13.41	.....	.....	1.241	.....	.....
Averages, limits, and totals.....	4	4	16.7	17.81	.....	.....	2.25	.....	.....	15.56	.....	.....	.884	.....	.....
CARMAN.															
Geneva, N. Y.....	1	1	16.1	16.73	.....	.....	3.44	.....	.....	13.29	.....	.....	1.654	.....	.....
CATAWBA.															
Kelleys Island, Ohio.....	14	11	21.0	23.14	25.17	21.46	2.30	2.57	2.02	20.84	22.70	19.31	.999	1.170	0.840
Middle Bass, Ohio.....	28	22	21.1	23.39	24.99	21.78	2.46	3.02	1.86	20.93	22.55	19.25	1.063	1.305	.754
North Bass, Ohio.....	10	9	21.4	23.84	24.80	22.83	2.32	2.68	1.88	21.52	22.87	20.35	1.058	1.226	.795
Put in Bay, Ohio.....	10	9	20.7	22.82	24.57	20.23	2.52	2.73	2.27	20.30	22.01	17.96	1.192	1.335	1.095
Venice, Ohio.....	5	3	21.3	23.09	24.59	20.89	2.35	2.54	2.10	20.74	22.21	18.65	1.045	1.144	.938
Vermilion, Ohio.....	1	1	21.7	24.17	.....	.....	2.51	.....	.....	21.66	.....	.....	1.091	.....	.....
Sandusky, Ohio.....	16	1	20.7	22.85	23.41	21.99	2.62	3.56	2.18	20.23	20.88	18.43	1.091	1.219	.893
Bluff Point, N. Y.....	1	1	20.0	21.75	.....	.....	2.80	.....	.....	18.95	.....	.....	1.444	.....	.....
Jerusalem, N. Y.....	1	1	19.6	21.28	.....	.....	2.95	.....	.....	18.33	.....	.....	1.606	.....	.....
Pulteney, N. Y.....	1	1	21.3	23.38	.....	.....	2.60	.....	.....	20.78	.....	.....	1.230	.....	.....
Urbana, N. Y.....	4	4	20.3	22.31	23.38	20.81	2.71	2.92	2.30	19.60	20.65	17.89	1.286	1.530	.994
North East, Pa.: South Shore Wine Co..	2	1	18.0	19.25	19.26	19.23	3.15	3.49	2.81	16.20	16.42	15.77	1.729	1.996	1.462
Averages, limits, and totals.....	93	64	20.0	23.07	25.17	19.23	2.50	3.56	1.86	20.51	22.87	15.77	1.097	1.996	.754
CHAMPION.															
Geneva, N. Y.....	1	1	13.2	14.30	.....	.....	2.40	.....	.....	11.90	.....	.....	.915	.....	.....
CHAUTAQUA.															
Geneva, N. Y.....	1	1	15.2	15.84	.....	.....	2.34	.....	.....	13.50	.....	.....	1.043	.....	.....
CLEVENER 7-12.															
Geneva, N. Y.....	1	1	17.8	18.71	.....	.....	3.75	.....	.....	14.96	.....	.....	1.196	.....	.....
CLINTON.															
North Bass, Ohio.....	1	1	23.5	26.01	.....	.....	3.68	.....	.....	22.33	.....	.....	1.520	.....	.....
Venice, Ohio.....	2	2	23.4	23.89	25.91	21.86	2.85	4.69	3.00	20.04	22.91	17.17	2.117	2.588	1.646
Geneva, N. Y.....	1	1	19.5	20.78	.....	.....	4.60	.....	.....	16.18	.....	.....	2.272	.....	.....
Pulteney, N. Y.....	1	1	24.1	26.46	.....	.....	3.26	.....	.....	23.20	.....	.....	1.726	.....	.....
North East, Pa.: South Shore Wine Co..	2	.....	20.8	22.08	23.14	21.02	3.72	3.94	3.50	18.36	19.64	17.08	2.260	2.494	2.026
Averages, limits, and totals.....	7	5	22.3	23.60	.....	.....	3.81	.....	.....	19.79	.....	.....	2.039	.....	.....
CLOETA 19-2.															
Geneva, N. Y.....	1	1	(*)	18.92	.....	.....	2.90	.....	.....	16.02	.....	.....	1.088	.....	.....
COLERAIN.															
Geneva, N. Y.....	1	1	16.5	17.48	.....	.....	4.72	.....	.....	12.76	.....	.....	.870	.....	.....
CORBY.															
Geneva, N. Y.....	1	1	15.3	15.92	.....	.....	2.15	.....	.....	13.77	.....	.....	.938	.....	.....

¹ Four samples.² One sample.³ Brix not read.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar-as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
CONCORD.															
Kelleys Island, Ohio.....	1	1	19.0	20.81			2.29			18.52			0.623		
Middle Bass, Ohio.....	19	19	18.4	20.84	21.73	17.01	2.44	3.16	1.80	17.41	19.23	16.03	.801	1.069	0.611
North Bass, Ohio.....	3	1	19.6	21.90	22.30	21.20	2.27	2.59	2.03	19.63	20.17	19.01	.650	.671	.608
Venice, Ohio.....	6	5 ²	20.5	22.43	23.43	21.59	2.65	3.50	1.96	19.76	20.37	18.88	.679	.836	.536
Vermilion, Ohio.....	1	1	17.3	18.19			2.52			15.67			.840		
Brocton, N. Y.....	8	1	18.7	20.50	21.36	19.60	2.09	2.63	1.87	18.16	19.49	17.17	.786	.983	.604
Bluff Point, N. Y.....	1	1	16.5	17.77			2.59			15.18			.926		
Fredonia, N. Y.....	11	1	16.5	17.69	19.37	15.16	2.41	2.65	2.03	15.10	16.72	12.67	.925	1.009	.795
Geneva, N. Y.....	1	1	14.7	15.42			2.46			12.96			1.050		
Hammondsport, N. Y.....	2	2	16.5	17.71	18.66	16.75	2.53	2.56	2.49	15.18	16.10	14.26	.986	1.013	.960
Jerusalem, N. Y.....	1	1	18.6	20.15			2.25			17.90			.731		
Pulteney, N. Y.....	1	1	18.7	19.60			2.41			17.19			.979		
Silver Creek, N. Y.....	2	1	15.9	17.19	18.40	15.97	2.41	2.61	2.21	14.78	16.19	13.36	1.030	1.110	.949
Urbana, N. Y.: Urbana Wine Co.....	2	1	16.8	17.66	18.45	16.86	2.25	2.28	2.21	15.41	16.17	14.65	.974	.979	.968
North East, Pa.....	23	9	17.7	19.04	23.01	12.90	2.45	2.76	2.17	16.58	20.48	10.41	.905	1.136	.671
Lawton, Mich.....	6	2	18.9	20.37	20.99	19.13	2.40	2.66	2.21	17.97	18.75	16.81	.761	.945	.660
Averages, limits, and totals.....	88	48	18.0	19.42	23.43	12.90	2.40	3.50	1.80	17.05	20.48	10.41	.834	1.069	.536
CREVELING.															
Geneva, N. Y.....	1	1	15.4	16.18			2.25			13.93			1.009		
CROTON 11-4.															
Geneva, N. Y.....	1	1	13.4	15.07			3.23			11.84			.788		
DAISY 7-2.															
Geneva, N. Y.....	1	1	18.0	19.29			2.34			16.95			.653		
DELAGO.															
Geneva, N. Y.....	1	1	18.6	19.86			2.61			17.25			1.009		
DELAWARE.															
Kelleys Island, Ohio.....	1	1	24.7	27.51			2.52			24.99			.641		
Middle Bass, Ohio.....	6	3 ²	23.6	26.51	27.62	24.46	2.41	2.72	2.15	23.76	25.47	22.01	.841	.900	.765
North Bass, Ohio.....	1	1	23.5	26.25			1.68			24.57			.724		
Venice, Ohio.....	3	3 ⁴	24.3	26.77	27.54	25.30	2.48	2.92	2.21	24.29	25.24	23.09	.773	.881	.713
Bluff Point, N. Y.....	1	1	20.5	22.96			3.14			19.82			1.013		
Fredonia, N. Y.....	1	1	18.8	20.42	21.99	19.63	2.95	3.21	2.75	17.47	19.24	16.42	1.229	1.312	1.076
Geneva, N. Y.....	1	1	18.8	20.15			2.41			17.74			1.166		
Hammondsport, N. Y.....	3	3	21.0	22.87	23.12	22.49	2.46	2.62	2.37	20.41	20.60	20.12	.866	.945	.743
Pulteney, N. Y.....	3	2	20.4	21.97	23.96	19.86	2.38	2.52	2.26	19.59	21.70	17.50	.968	1.020	.919
Rhelsms, N. Y.....	1	1	20.1	21.82			2.41			19.11			1.020		
Urbana, N. Y.: Urbana Wine Co.....	2	1	22.4	24.41	24.91	23.91	2.26	2.31	2.20	22.16	22.71	21.60	.857	.859	.855
New York State: Name lost.....	1	1	20.0	21.41			2.42			18.99			1.001		
North East, Pa.....	2	1	20.8	22.38	22.72	22.04	2.61	2.71	2.51	19.77	20.01	19.53	.981	.994	.968
Lawton, Mich.....	1	1	22.6	25.20			2.54			22.66			.945		
Averages, limits, and totals.....	29	24	21.8	23.92	27.62	19.63	2.49	3.21	2.15	21.36	25.47	16.42	.922	1.312	.713
DIAMOND.															
Geneva, N. Y.....	1	1	17.9	19.03			2.45			16.58			.998		

¹ Eighteen samples.² Four samples.⁸ Nine samples.⁴ Three samples.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
DIANA.															
North Bass, Ohio.....	1	1	21.5	23.70			2.35			21.35			0.728		
Geneva, N. Y.....	1	1	19.6	21.23			2.66			18.67			1.200		
Pulteney, N. Y.....	1	1	20.6	22.59			2.41			20.18			.923		
Hammondsport, N. Y....	1	1	21.3	23.57			2.68			20.89			1.009		
Averages, limits, and totals.....	4	4	20.8	22.80			2.53			20.27			.965		
DUCHESS.															
Geneva, N. Y.....	1	1	18.0	19.63			2.33			17.30			.750		
Pulteney, N. Y.....	1	1	18.9	20.34			1.82			18.52			.638		
Rheims, N. Y.....	1	1	17.8	18.87			2.24			16.63			.814		
Averages, limits, and totals.....	3	3	18.3	19.61			2.13			17.48			.734		
EARLY DAWN.															
Geneva, N. Y.....	1	1	17.6	18.56			2.34			16.22			1.065		
EARLY GOLDEN 5-3.															
Geneva, N. Y.....	1	1	19.6	20.89			2.39			18.50			.848		
EARLY VICTOR.															
Fredonia, N. Y.....	1	1	16.6	17.59						8.07			.923		
ELDORADO.															
Geneva, N. Y.....	1	1	20.3	22.02			2.39			19.63			.784		
ELVIRA.															
Kelleys Island, Ohio.....	1	1	20.6	22.57			2.19			20.38			.754		
Middle Bass, Ohio.....	1	1	16.5	17.14			2.72			14.42			1.050		
North Bass, Ohio.....	1	1	17.4	18.92			1.46			17.46			.938		
Venice, Ohio.....	1	1	17.8	19.05			2.68			16.37			.908		
Hammondsport, N. Y.....	1	1	15.3	16.13			2.47			13.66			1.140		
Pulteney, N. Y.....	1	1	16.1	16.70			2.50			14.20			1.264		
Rheims, N. Y.....	1	1	15.5	15.79			2.78			13.01			1.402		
Urbana, N. Y.....	1	1	17.4	18.74			2.69			16.05			1.144		
Averages, limits, and totals.....	8	8	17.1	18.13			2.43			15.69			1.083		
EMPIRE STATE.															
Put in Bay, Ohio.....	1	1	15.5	16.10			1.86			14.24			.848		
Geneva, N. Y.....	1	1	18.7	20.18			2.23			17.95			.559		
Averages, limits, and totals.....	2	2	17.1	18.14			2.05			16.10			.704		
EUMELAN.															
North Bass, Ohio.....	1	1	14.9	15.58			2.04			13.54			.930		
Geneva, N. Y.....	1	1	14.8	15.89			2.39			13.50			.964		
Rheims, N. Y.....	1	1	19.8	21.20			2.15			18.87			.983		
Urbana, N. Y.: Urbana Wine Co.....	2	1	20.2	21.58	21.75	21.41	2.17	2.20	2.13	19.42	19.62	19.21	.949	0.994	0.904
Averages, limits, and totals.....	5	4	18.0	19.13	21.75	21.41	2.18	2.20	2.13	16.95	19.62	19.21	.955	.994	.904
GOFF.															
Geneva, N. Y.....	2	1	16.8	18.07	21.67	14.46	2.43	2.51	2.35	15.64	19.32	11.95	.895	.964	.825

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
GOLD DUST.															
Geneva, N. Y.	1	1	17.1	18.24	.....	.....	2.53	.....	.....	15.71	.....	.....	0.694	.....	.....
GOLDEN.															
Geneva, N. Y.	1	1	17.4	18.69	.....	.....	1.65	.....	.....	17.04	.....	.....	.420	.....	.....
GLENFELD.															
Geneva, N. Y.	1	1	16.5	17.25	.....	.....	2.69	.....	.....	14.56	.....	.....	1.106	.....	.....
GUT EDEL.															
Kelleys Island, Ohio.	1	1	21.5	23.20	.....	.....	2.84	.....	.....	20.36	.....	.....	1.350	.....	.....
HAYES.															
Put in Bay, Ohio.	1	1	16.8	17.72	.....	.....	2.56	.....	.....	15.16	.....	.....	1.118	.....	.....
HARTFORD.															
Geneva, N. Y.	1	1	19.3	20.83	.....	.....	2.67	.....	.....	18.16	.....	.....	.881	.....	.....
Fredonia, N. Y.	1	1	14.7	15.71	.....	.....	2.25	.....	.....	13.46	.....	.....	.904	.....	.....
Averages, limits, and totals.	2	2	17.0	18.27	.....	.....	2.46	.....	.....	15.81	.....	.....	.893	.....	.....
HERBERT.															
Geneva, N. Y.	1	1	18.0	19.13	.....	.....	2.59	.....	.....	16.54	.....	.....	1.200	.....	.....
HEXAMER 24-20.															
Geneva, N. Y.	1	1	19.4	20.10	.....	.....	3.74	.....	.....	16.36	.....	.....	1.245	.....	.....
HICKS.															
Geneva, N. Y.	1	1	15.0	15.79	.....	.....	2.47	.....	.....	13.32	.....	.....	1.159	.....	.....
ILLINOIS CITY.															
Geneva, N. Y.	1	1	18.8	20.07	.....	.....	2.26	.....	.....	17.81	.....	.....	.998	.....	.....
IONA.															
Middle Bass, Ohio.	1	1	(1)	23.17	.....	.....	2.39	.....	.....	20.78	.....	.....	.664	.....	.....
North Bass, Ohio.	2	2	21.5	24.03	25.07	22.99	2.47	2.61	2.32	21.57	22.46	20.67	.904	1.155	0.653
Vermilion, Ohio.	2	2	21.5	23.67	23.88	23.46	2.36	2.38	2.34	21.31	21.50	21.12	.928	.956	.900
Geneva, N. Y.	1	1	19.6	21.25	.....	.....	2.83	.....	.....	18.42	.....	.....	1.426	.....	.....
Portland, N. Y.	1	1	21.5	23.83	.....	.....	2.46	.....	.....	21.37	.....	.....	1.046	.....	.....
Pulteney, N. Y.	1	1	21.4	23.41	.....	.....	2.51	.....	.....	20.90	.....	.....	1.234	.....	.....
Averages, limits, and totals.	8	8	21.2	23.38	25.07	22.99	2.48	2.38	2.32	20.90	22.46	20.67	1.004	1.155	.653
ISABELLA.															
Kelleys Island, Ohio.	1	1	19.1	21.04	.....	.....	2.26	.....	.....	18.78	.....	.....	.716	.....	.....
North Bass, Ohio.	1	1	20.0	21.83	.....	.....	2.12	.....	.....	19.71	.....	.....	.836	.....	.....
Hammondsport, N. Y.	1	1	20.0	21.88	.....	.....	2.11	.....	.....	19.77	.....	.....	.773	.....	.....
Pulteney, N. Y.	1	1	16.7	17.88	.....	.....	2.44	.....	.....	15.44	.....	.....	1.016	.....	.....
Urbana, N. Y.	4	4	16.6	17.79	19.58	16.31	2.50	2.74	2.31	15.29	16.97	13.57	1.028	1.076	.956
Wayne, N. Y.	1	1	17.1	18.56	.....	.....	2.67	.....	.....	15.89	.....	.....	1.163	.....	.....
Averages, limits, and totals.	9	9	17.6	19.15	19.58	16.31	2.40	2.74	2.31	16.75	16.97	13.57	.957	1.076	.956

¹ Brix not read.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.			
			Brix.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
ISABELLA SEEDLING.															
Geneva, N. Y.	1	1	15.6	16.47	.....	.....	2.84	.....	.....	13.63	.....	.....	1.174	.....	.....
IVES.															
Ceylon, Ohio.	3	3	18.4	19.34	20.55	18.45	2.43	2.52	2.32	16.92	18.23	16.03	0.678	0.844	0.559
Danbury, Ohio.	1	1	15.4	16.62	.....	.....	2.71	.....	.....	13.91	.....	.....	.608	.....	.....
Kelleys Island, Ohio.	1	1	17.5	18.63	.....	.....	2.09	.....	.....	16.54	.....	.....	.555	.....	.....
Middle Bass, Ohio.	9	8	16.4	17.41	19.31	14.93	2.47	2.73	2.23	16.92	16.68	12.37	.823	.960	.713
Venice, Ohio.	2	2	18.3	18.66	19.81	17.51	2.77	2.95	2.59	15.89	16.86	14.92	.733	.746	.720
Vermilion, Ohio.	2	2	20.1	21.36	21.44	21.28	2.45	2.55	2.35	18.91	18.93	18.89	.655	.683	.626
Bluff Point, N. Y.	1	1	19.6	21.33	.....	.....	2.48	.....	.....	18.85	.....	.....	.641	.....	.....
Hammondsport, N. Y.	1	1	17.9	19.42	.....	.....	2.52	.....	.....	16.90	.....	.....	.836	.....	.....
North East, Pa.: South Shore Wine Co.	2	1	16.3	17.20	18.22	16.18	3.02	3.08	*2.96	14.18	15.14	13.22	1.063	1.151	.975
Averages, limits, and totals.	22	20	17.3	18.42	21.44	14.93	2.54	3.08	2.23	15.88	18.23	12.37	.772	1.151	.559
JANESVILLE.															
Geneva, N. Y.	1	1	16.6	17.48	.....	.....	3.53	.....	.....	13.95	.....	.....	1.462	.....	.....
LINDLEY.															
Fredonia, N. Y.	1	1	15.5	16.13	.....	.....	2.69	.....	.....	13.44	.....	.....	1.155	.....	.....
Geneva, N. Y.	1	1	18.8	20.26	.....	.....	2.49	.....	.....	17.77	.....	.....	.953	.....	.....
Averages, limits, and totals.	2	2	17.2	18.20	.....	.....	2.59	.....	.....	15.61	.....	.....	1.054	.....	.....
LUCILE.															
Fredonia, N. Y.	1	1	15.6	16.15	.....	.....	2.70	.....	.....	13.45	.....	.....	.915	.....	.....
Geneva, N. Y.	1	1	(²)	17.59	.....	.....	2.12	.....	.....	15.47	.....	.....	.814	.....	.....
Averages, limits, and totals.	2	2	15.6	16.87	.....	.....	2.41	.....	.....	14.46	.....	.....	.865	.....	.....
MARION.															
Geneva, N. Y.	2	1	19.0	21.07	21.15	20.99	3.77	3.83	3.70	17.31	17.32	17.29	1.566	1.610	1.522
MASSASOIT.															
Geneva, N. Y.	1	1	16.3	17.09	.....	.....	1.88	.....	.....	15.21	.....	.....	.754	.....	.....
MILLS.															
Portland, N. Y.	2	1	20.0	21.99	22.07	21.91	2.14	2.15	2.13	19.85	19.94	19.76	.741	.754	.728
MISSOURI RIESLING.															
Kelleys Island, Ohio.	1	1	19.4	20.78	.....	.....	2.42	.....	.....	18.36	.....	.....	.941	.....	.....
MONTEFIORE.															
Kelleys Island, Ohio.	1	1	(²)	23.65	.....	.....	2.29	.....	.....	21.36	.....	.....	.784	.....	.....
MOORE DIAMOND.															
Fredonia, N. Y.	1	1	18.0	19.52	.....	.....	3.06	.....	.....	16.46	.....	.....	1.121	.....	.....
MOORE EARLY.															
Fredonia, N. Y.	1	1	15.1	15.87	.....	.....	.....	.....	.....	9.04	.....	.....	.825	.....	.....

¹ One sample.² Brix not read.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
MOYER.															
Fredonia, N. Y.....	1	1	18.5	20.00			2.50			17.50			0.780		
Geneva, N. Y.....	1	1	19.1	20.12			2.40			17.72			.641		
Averages, limits, and totals.....	2	2	18.8	20.06			2.45			17.61			.711		
R. W. MUNSON.															
Geneva, N. Y.....	1	1	14.7	15.48			2.91			12.57			1.490		
NECTAR.															
Geneva, N. Y.....	1	1	18.3	19.79			2.53			17.26			1.256		
NIAGARA.															
North Bass, Ohio.....	2	1	19.2	21.08	21.54	20.62	2.17	2.30	2.03	18.92	19.24	18.59	.448	0.450	0.446
Benton, N. Y.....	1	1	15.6	16.91			2.21			14.70			.754		
Fredonia, N. Y.....	1	1	15.3	16.02			3.13			12.89			.968		
Geneva, N. Y.....	1	1	12.9	13.42			2.06			11.36			.773		
Penn Yan, N. Y.....	1	1	12.6	14.38			2.71			11.67			.840		
North East, Pa.: South Shore Wine Co..	1	1	17.8	19.08			2.37			16.71			.806		
Lawton, Mich.....	1	1	17.0	18.03			2.13			15.90			.791		
Averages, limits, and totals.....	8	7	16.2	17.50	21.54	20.62	2.37	2.30	2.03	15.13	19.24	18.59	.728		
NOAH.															
Geneva, N. Y.....	1	1	16.5	17.33			3.08			14.25			1.632		
NORFOLK.															
Geneva, N. Y.....	1	1	17.4	18.58			2.48			16.10			1.144		
NORTON.															
Kelleys Island, Ohio....	1	1	22.8	24.27			3.53			20.74			1.856		
North Bass, Ohio.....	1	1	23.9	26.54			3.65			22.89			1.522		
Venice, Ohio.....	2	2	(1) 24.16	24.20	24.12		3.54	3.59	3.49	20.62	20.63	20.61	1.787	1.942	1.632
Vermilion, Ohio.....	1	1	23.5	26.01			3.85			22.16			1.462		
Averages, limits, and totals.....	5	5	23.4	25.43	24.20	24.12	3.62	3.59	3.49	21.41	20.63	20.61	1.683	1.942	1.632
OLITA.															
Geneva, N. Y.....	1	1	17.0	18.16			2.19			15.97			.908		
PIERCE.															
Geneva, N. Y.....	1	1	14.0	14.87			2.45			12.42			1.253		
POCKLINGTON.															
North Bass, Ohio.....	1	1	17.8	19.16			1.87			17.29			.596		
Venice, Ohio.....	1	1	18.0	19.31			2.53			16.78			1.095		
Averages, limits, and totals.....	2	2	17.9	19.24			2.20			17.04			.846		
REGAL.															
Portland, N. Y.....	1	1	16.8	18.14			2.03			16.11			.836		
REQUA.															
Geneva, N. Y.....	2	1	17.9	19.23	20.70	17.75	2.27	2.36	2.18	16.75	18.52	14.97	.844	.960	.728
ROGERS NO. 24.															
Geneva, N. Y.....	1	1	15.0	15.66			2.47			13.19			1.238		

¹ Brix not read.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
ROGERS NO. 32.															
Geneva, N. Y.	1	1	16.9	17.85			2.42			15.43			1.181		
RUPERT.															
Geneva, N. Y.	1	1	16.1	16.83			3.55			13.28			1.756		
SALEM.															
North Bass, Ohio.	1	1	20.5	22.49			1.58			20.91			.521		
Bluff Point, N. Y.	1	1	18.9	20.60			2.78			17.82			.938		
Pulteney, N. Y.	1	1	22.2	24.41			2.63			21.78			1.024		
Averages, limits, and totals.	3	3	20.5	22.50			2.33			20.17			.828		
ST. LOUIS.															
Geneva, N. Y.	1	1	15.2	15.76			2.45			13.31			1.140		
SCHRAIDTES.															
Middle Bass, Ohio.	1	1	19.7	21.15			3.86			17.29			1.632		
North Bass, Ohio.	1	1	20.9	23.20			3.93			19.27			1.556		
Averages, limits, and totals.	2	2	20.3	22.18			3.90			18.28			1.594		
TELEGRAPH.															
Fredonia, N. Y.	1	1	16.3	17.46			3.56			13.90			1.256		
TRIUMPH.															
Geneva, N. Y.	1	1	(1)	16.88			2.79			14.09			1.354		
UNKNOWN.															
Kelleys Island, Ohio.	1	1	23.8	26.43			2.04			24.39			.626		
Middle Bass, Ohio.	3	2 ¹	18.9	21.23	22.54	20.05	2.49	2.63	2.30	18.74	19.91	17.50	.677	0.743	0.623
Venice, Ohio.	3	2	23.6	26.02	28.49	24.38	2.39	2.77	2.01	23.84	26.11	22.37	.637	.848	.439
Vermilion, Ohio.	3	1	20.3	22.66	22.72	22.59	2.68	2.72	2.64	18.23	20.00	14.75	1.075	1.144	1.005
Fredonia, N. Y.	1	1	16.1	17.62			3.65			13.97			1.354		
Averages, limits, and totals.	11	7	21.0	23.11	28.49	20.05	2.58	2.77	2.01	20.55	26.11	14.75	.813	1.144	.439
TRAGEDY.															
Geneva, N. Y.	1	1	(1)	18.82			2.17			16.65			.776		
VERGENNES.															
Geneva, N. Y.	1	1	18.1	19.50			2.72			16.78			1.163		
Portland, N. Y.	2	1	18.4	19.92	20.26	19.58	2.31	2.50	2.11	17.62	18.15	17.08	1.041	1.129	.953
Averages, limits, and totals.	3	2	18.3	19.78			2.44			17.34			1.082		
WAPENUKA.															
Geneva, N. Y.	1	1	12.9	13.47			4.05			9.42			1.084		
WILDER.															
Fredonia, N. Y.	1	1	15.6	16.49			2.38			14.11			1.189		
WORDEN.															
Venice, Ohio.	10	2 ³	18.3	19.33	22.51	15.08	2.34	2.95	2.00	16.99	20.28	12.13	.876	1.283	.634
Fredonia, N. Y.	1	1	12.8	13.49			2.54			10.95			1.372		
Geneva, N. Y.	3	1	13.8	14.68	14.80	14.56	2.45	2.53	2.36	12.56	13.21	12.03	1.271	1.312	1.211
Penn Yan, N. Y.	1	1	13.1	14.20			2.27			11.93			1.020		
Averages, limits, and totals.	15	5	14.3	17.88			2.36			16.46			.998		

¹ Brix not read.² Two samples.³ One sample.

TABLE III.—Average, maximum, and minimum data for 1910, arranged by varieties and localities—Continued.

Variety and locality.	Number of samples.	Number of growers.	Brix.	Total solids.			Sugar-free solids.			Sugar as invert.			Acid as tartaric.		
				Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
WYOMING RED.															
Fredonia, N. Y.....	1	1	15.9	16.78	.....	.....	2.95	.....	.....	13.83	.....	.....	0.855	.....	.....
Geneva, N. Y.....	1	1	14.1	14.85	.....	.....	2.09	.....	.....	12.76	.....	.....	.754	.....	.....
Averages, limits, and totals.....	2	2	15.0	15.82	.....	.....	2.52	.....	.....	13.29	.....	.....	.805	.....	.....
YONKEN HONEY DEW.															
Geneva, N. Y.....	1	1	17.9	19.10	.....	.....	2.76	.....	.....	16.34	.....	.....	.956	.....	.....
No. 3197.....	1	1	19.6	22.36	.....	.....	2.26	.....	.....	20.10	.....	.....	.758	.....	.....
No. 4069.....	1	1	15.7	16.68	.....	.....	1.72	.....	.....	14.96	.....	.....	.604	.....	.....
No. 2698.....	1	1	15.2	215.87	.....	.....	1.56	.....	.....	14.31	.....	.....	.510	.....	.....
No. 98.....	1	1	19.3	20.83	.....	.....	1.79	.....	.....	19.04	.....	.....	.544	.....	.....
No. 116.....	1	1	15.8	16.68	.....	.....	1.83	.....	.....	14.85	.....	.....	.529	.....	.....
No. 3345.....	1	1	13.6	14.09	.....	.....	1.87	.....	.....	12.22	.....	.....	.731	.....	.....
No. 2717.....	1	1	17.0	18.08	.....	.....	1.89	.....	.....	16.19	.....	.....	.645	.....	.....
No. 2652.....	1	1	19.9	21.31	.....	.....	2.06	.....	.....	19.25	.....	.....	.645	.....	.....

TABULATION OF ANALYTICAL DATA ON SAMPLES GROWN AND ANALYZED AT CHARLOTTESVILLE, VA.

TABLE IV.—Average, maximum, and minimum data, 1908–1910, arranged by varieties. (Analyses by Hartmann and Eoff.)

[Results expressed in grams per 100 cc of juice.]

Year.	Variety.	Number of samples.	Number of growers.	Specific gravity.	Total solids.			Sugar-free solids.			Total sugar as invert.			Acid as tartaric.		
					Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
1908	Norton.....	9	7	1.1009	26.26	27.88	24.46	3.64	4.50	2.97	22.63	24.73	19.99	1.088	1.290	0.975
1909	Concord.....	14	5	1.0731	18.94	20.49	16.99	2.99	3.54	2.59	16.01	17.50	14.08	.744	.840	.645
1909	Cynthiana.....	1	1	1.0918	23.91	.....	.....	4.16	.....	.....	19.75	.....	.....	.986	.....	.....
1909	Delaware ¹	2	1	1.0969	25.30	26.43	24.17	2.86	3.08	2.63	22.45	23.80	21.09	.702	.784	.619
1909	Elvira.....	1	1	1.0698	18.11	.....	.....	2.76	.....	.....	15.35	.....	.....	.735	.....	.....
1909	Ives.....	12	7	1.0702	18.26	22.09	15.92	3.15	3.54	2.79	15.11	18.60	13.00	.753	.866	.653
1909	Noah.....	2	1	1.0876	22.80	22.88	22.72	2.75	2.75	2.74	20.06	20.13	19.98	.957	.990	.923
1909	Norton.....	11	9	1.0957	24.93	25.88	23.49	3.56	3.98	2.92	21.35	22.45	20.00	.925	1.001	.776
1909	Riesling.....	1	1	1.0647	16.99	.....	.....	2.69	.....	.....	14.30	.....	.....	.851	.....	.....
1910	Concord ²	12	5	1.0747	19.44	21.65	17.04	3.11	3.61	2.60	16.33	18.15	14.07	.823	.904	.724
1910	Cynthiana.....	1	1	1.0962	25.04	.....	.....	3.92	.....	.....	21.10	.....	.....	1.080	.....	.....
1910	Delaware ¹	1	1	1.0888	23.12	.....	.....	2.12	.....	.....	21.00	.....	.....	.551	.....	.....
1910	Ives.....	15	9	1.0714	18.60	20.23	15.00	3.09	4.74	2.31	15.38	16.85	12.69	.714	.908	.611
1910	Norton.....	23	10	1.1003	26.23	28.54	24.17	3.88	4.63	3.37	22.44	25.04	20.10	.957	1.328	.750

¹ Mixed crops.² Three samples from Crozet, Va.

